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AIWA®

SERVICE MANUAL

DX-M45
DX-M78
DX-M755

COMPACT DISC PLAYER

- BASIC CD MECHANISM : CDM2-DC (CDM4-DC)
- TYPE. E, K (DX-M45)
  Y (DX-M78/M755)

SPECIFICATIONS

Type:	Compact disc digital audio system
Disc:	Compact disc
Scanning method:	Non contact optical scanner (semiconductor laser application)
Laser:	Semiconductor laser (λ=800 nm)
Rotation speed:	Approx. 500 rpm — 200 rpm (CLV)
Error correction:	Cross Interleave, Reed-Solomon Code
No. of channels:	2 channels
D-A conversion:	16-bit linear
Frequency response:	4 Hz—20 kHz ±0.5 dB
Harmonic distortion:	0.005%
S/N ratio:	95 dB
Dynamic range:	93 dB
Channel separation:	88 dB
Wow/Flutter:	Quartz oscillatory precision
Output terminal: (LINE OUT)	DX-M45E, K Terminal type: Pin jack Maximum output level: 1.4Vrms Load impedance: 10kΩ or more DX-M78 Terminal type: 13 pin connector Maximum output level: 1.4Vrms Load impedance: 10 kΩ or more

Disc specifications

Playing time:	Approx. 60 minutes (max. 74 minutes)
Dimensions:	Diameter 120 mm thickness 1.2 mm
Track pitch:	1.6 μm
Sampling frequency:	44.1 kHz

Power and Miscellaneous

Power supply:	DX-M45E AC 220V, 50/60 Hz DX-M45K AC 240V, 50/60 Hz	
Power consumption:	DX-M45E DX-M45K	15W 15W
Dimensions:	DX-M45E, K 360(W) × 85(H) × 314(D)mm DX-M78 360(W) × 85(H) × 314(D)mm	
Weight:	DX-M45E, K DX-M78	3.8 kg 3.3 kg

- Design and specifications are subject to change without notice.

AIWA Co., Ltd.

Tokyo Japan

Printed in Japan

PROTECTION OF EYES FROM LASER BEAM DURING SERVICING

This set employs a laser. Therefore, be sure to follow carefully the instructions below when servicing.

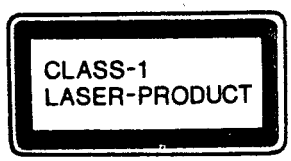
WARNING !!

WHEN SERVICING, DO NOT APPROACH THE LASER EXIT WITH THE EYE TOO CLOSELY. IN CASE IT IS NECESSARY TO CONFIRM LASER BEAM EMISSION, BE SURE TO OBSERVE FROM A DISTANCE OF MORE THAN 30 cm FROM THE SURFACE OF THE OBJECTIVE LENS ON THE OPTICAL PICK-UP BLOCK.

"Varoitus'. Laite sisältää laserdiodin, joka lähettää näkymätöntä silmille vaarallista lasersäteilyä."

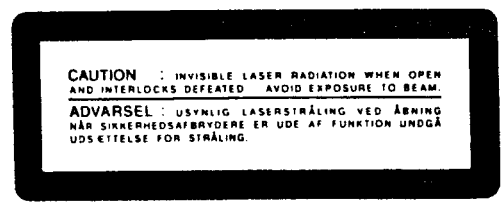
LASER WARNING LABELS

1. Protective Housing Label
   WARNING Label 1 . . . . . (E,K,Y model)



2. WARNING Label 4 . . . . . (E,K,Y model)

3. WARNING Label 3 . . . . . (E,K,Y model)


CAUTION : INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCKS DEFEATED AVOID EXPOSURE TO BEAM.
ADVARSEL : USYNLIG LASERSTRÅLING VED ÅBNING NÅR SIKKERHEDSAFBRYDERE ER UDE AF FUNKTION UNDGÅ UDSÆTTELSE FOR STRÅLING.

DISASSEMBLY INSTRUCTIONS

1. Hold-Down Holder Removal
   1) Release the boss while pressing the holder in the direction of arrow (1) to slide it.
   2) Remove the holder in the direction of arrow (2). (See Fig. 1)

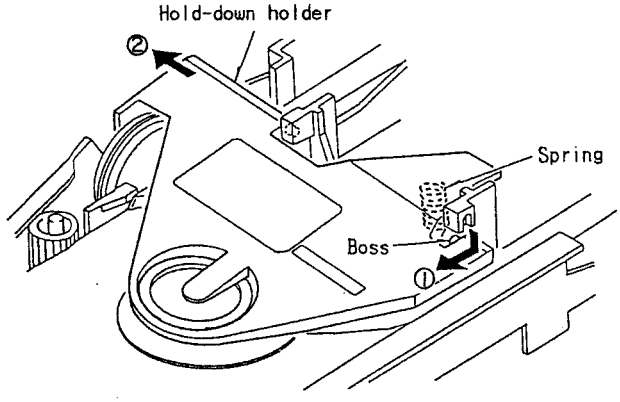


Fig. 1

2. Re-installing the CD Mechanism Assembly
   Check that the bosses of the CD mechanism assembly are inserted into each hole in the rubber cushions. (See Fig. 2)

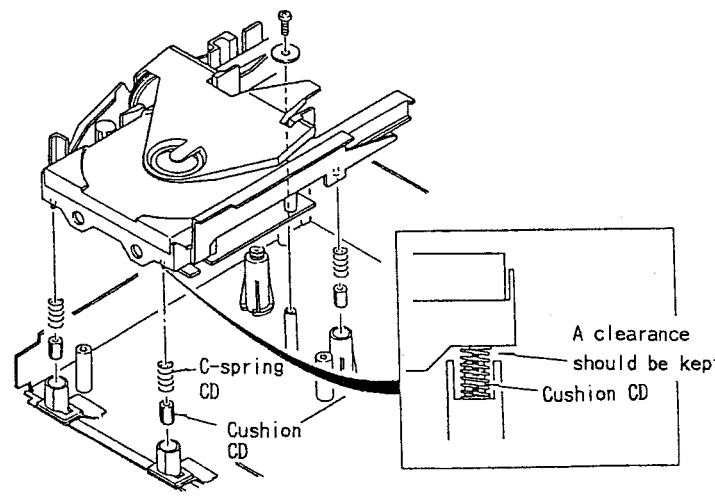


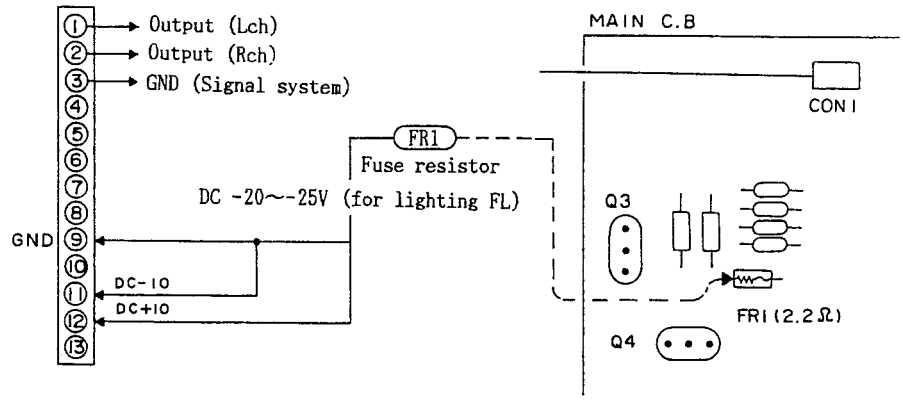
Fig. 2

Cautions when servicing

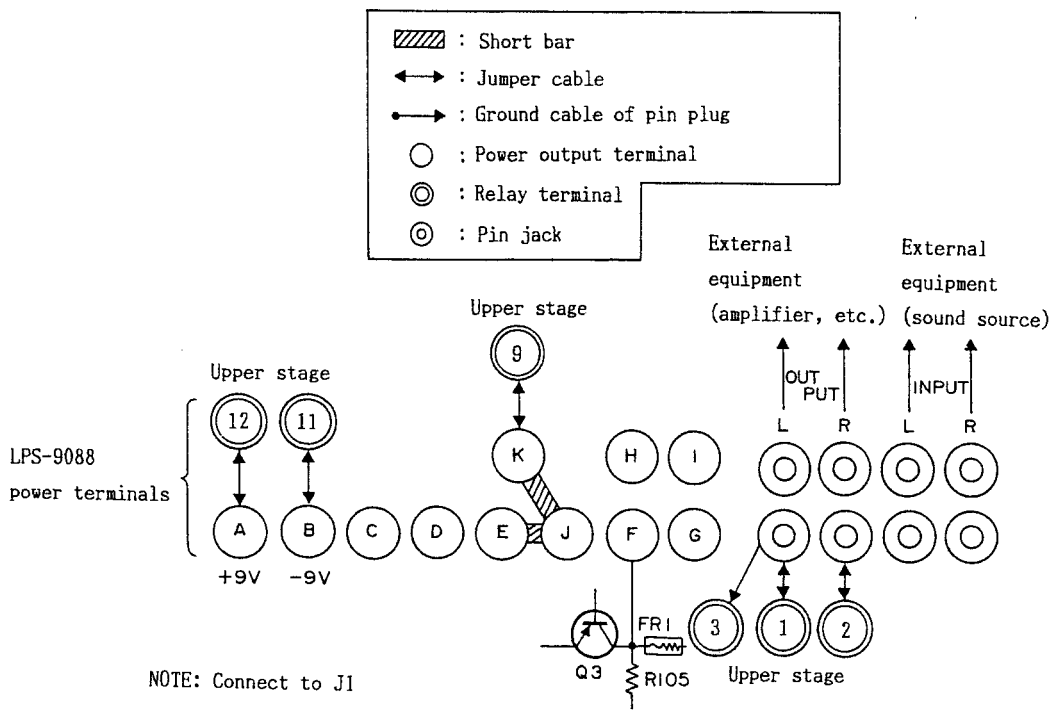
1. Models DX-M78 and DX-M755 do not have a power transformer and power is supplied to them from the CX-78 and CX-755 via a 13-pin flat cable. When Servicing DX-M78 or DX-M755, connect it to the CX-78 or CX-755 for the power supply. If you do not have the CX-78 or CX-755, perform the following procedure.

[When servicing the unassembled DX-M78 or DX-M755]

① 13-pin flat cable from an external power supply.



② Connection diagram when using Multi-Power Supply (LPS-9088)



TECHNICAL DATA

General

- Application: Compact Disc "Home Player"
- Operating position: Vertical (± 10°)
- Single–stage radial and balanced actuator for track following
- Track following error detection method : Push–Pull
- Focus error detection method : Double Foucault
- DC turntable motor with permanent magnets
- Dimensions: 130 x 100 x 44 mm
- Weight : abt. 270 grams

Radial actuator

- Swing angle: 72°
- Diameter readout range: from 47.4 mm ± 0.6 mm to 117.5 mm ± 0.5 mm
- Squareness relative to turntable: 90° ± 0.3°
- Bearing friction: 0.75 mNm
- Total ohmic resistance of the coils: 10 Ω ± 0.6 Ω
- Maximum allowable voltage: 14V/DC continuous
- K factor: 0.025 Nm/A (± 20%)

Focus actuator

- Vertical amplitude: 1.9 mm ± 0.2 mm
- DC voltage across the focus motor in focus: between –0.8V and +0.7V.
- Sensitivity: 13 mm/A
- Ohmic resistance: 23.5 Ω ± 2.5Ω
- Maximum allowable voltage: 8V/DC continuous

Laser diode LTO 22MC

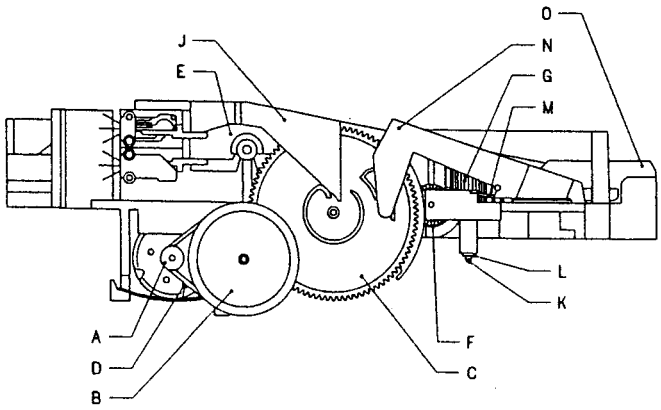
- Wave length: 780 nm ± 10 nm
- Light energy: 3 mW
- Voltage across the diode at 3mW: typical = 1.75 V, max. = 2.2 V

Turntable motor

- Sense of rotation: CW (clockwise)
- Nominal voltage: 2.2 V/DC
- Nominal speed: 210...600 rpm.
- Total ohmic resistance rotor: 16 Ω ± 1.6 Ω
- Maximum allowable voltage: 12V/DC

SERVICING OF THE TRAY MECHANISM

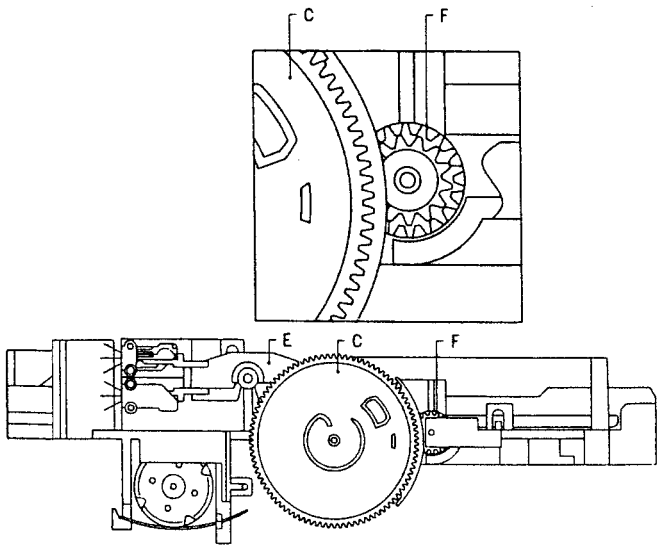
Disassembly of the tray mechanism



- Remove disc hold-down holder J by disassembling coil spring at rear. Then holder J can be taken out of its hinge points.
- Remove belt D.
- Disassemble pulley B after clamping ring on shaft has been removed.
- Remove lifting bracket N by elevating lug M and sliding bracket out of its shaft guiding.
- Remove gearwheel G by removing shaft K after ring L has been taken away.
- Now disc carrier O can be taken out of the holder by lifting it at the front and sliding it out of the guiding.
- Next cog wheel C, switch bracket E and gearwheel F can be removed successively.
- The tray motor with belt wheel A can be taken out by removing the spring.

Assembly of tray mechanism

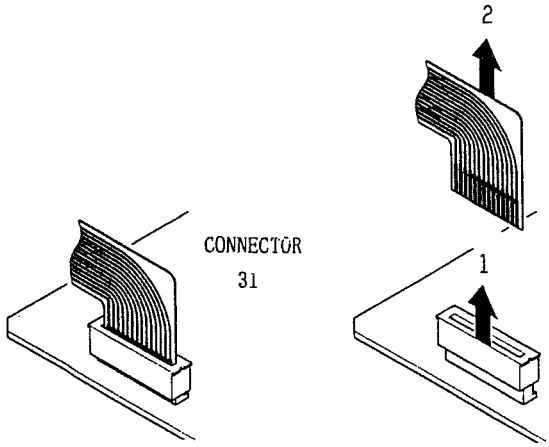
- Place disc carrier O in guiding and slide it in place (= disc carrier in position "close").
- Mount gearwheel F.
- Apply switch bracket E. The left-hand boss of the bracket should be positioned between the 2 switches.
- Ensure that the aperture in gearwheel F is vertical (see Fig. 4) and apply cog wheel C in the way described in Fig. 5.



- Turn cog wheel C counterclockwise till its final position and ensure that the boss of switch bracket E engages with the guiding at the rear of the cog wheel. Turn the cog wheel counterclockwise and clockwise and check if both switches are switched on alternately.
- Turn cog wheel C counterclockwise so that the upper switch is operated and mount pulley B in this position. Next apply the clamping ring.
- Mount gearwheel G and apply shaft K and clamping ring L.
  Ensure that gearwheel G is positioned before shaft and clamping ring are mounted.
- Apply lifting bracket N. Ensure that the fork at the right of the lifting bracket encloses the guide rail of the tray.
- Mount the motor with pully A and apply belt D.
- Next hold-down holder J and the compression spring can be mounted.
- Check after mounting the working of the tray mechanism by turning pulley B counterclockwise and clockwise.

- Servicing the RAFOC unit (= Radial and Focusing unit, item no. 53. See exploded view CDM-2).

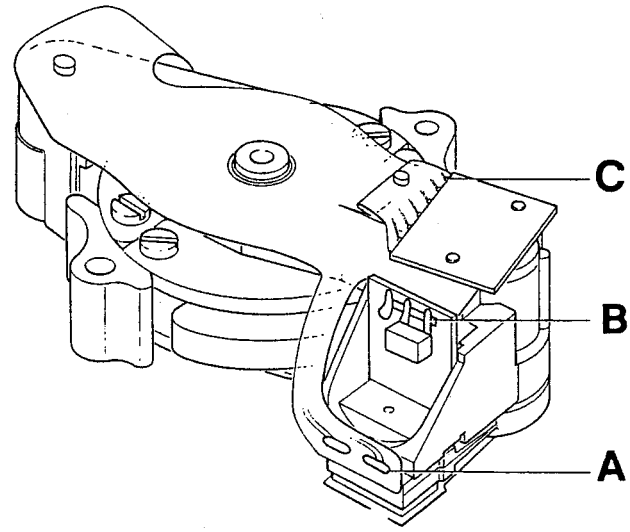
- Take the CD mechanism and servo PCB assembly out of the set.
  (For demounting instructions see the service manual of the set).
- Remove the flexible PCB from connector 31 on the servo PCB by lifting the upper part of the connector and taking the flexible PCB out.



- Undo the 4 screws on the conductor-side of the servo + pre-amplifier PCB.
  The servo + pre-amplifier PCB can now be removed.
- The RAFOC unit can be removed after the two fixing screws M3 X 25 have been loosened.
  Caution: When doing so, the two nuts M3 on the upper side of the CD mechanism come loose.
- Now the pivot plate, item no. 56, can be removed.
- After removing the clamping piece, item no. 51, the RAFOC unit/flexible PCB assembly can be taken out.
  Attention: When mounting the RAFOC unit, see to it that the flexible PCB reset well against the mounting plate at the height of the clamping piece (item no. 51).
  In some cases, after exchanging the RAFOC unit/ flexible PCB assembly, it may be neccessary to glue the flexible PCB with a fast-drying glue to prevent the RAFOC unit from rubbing against the flexible PCB.
  The gluing should be done very carefully.
- When the laser and/or the monitor diodes are defective, it will be necessary to replace the RAFOC unit, item no. 53.
- After mounting the RAFOC unit you should make sure that the arm runs clear over the entire disc diameter.
  This can be checked by means of a spring-pressure gauge which is held against the magnet of the focusing unit.
  The friction of the arm, measured over the entire meter reading, may not be greater than 25mN.
- A fast check of the clearance of the arm is possible in service position 0.
  The RAFOC unit can be moved across the diameter of the disc by operating the SEARCH FORW. and REV. keys. (see DETAILED MEASURING METHOD Servo-circuit).

- Replacing the flexible PCB (item 54)

- Demount the RAFOC unit.
- Desolder the connections A of the flexible PCB.



- Before desoldering the connections C of the photodiode PCB, the positions of the connecting points of the photodiode PCB should be marked, so that afterwards the PCB can correctly be replaced.
- Now the 6 connections C of the photodiode PCB can be desoldered by heating the pins C one by one unit the flexible PCB comes loose.
  This should be done very carefully.
- Desolder the 4 connections of the radial coils.
- Unsolder the 3 connections of the laser PCB.

- Mounting the flexible PCB (item 54)

- Solder the 4 connections of the radial coils.
- Apply the connections A and B.
- Before the 6 connections of the photodiode PCB can be soldered, they should be provided with an extra coating of tin.
- Place the flexible PCB under the photodiode PCB.
- In order to hold this position, the flexible PCB may be supported (for example by an expanded paper-clip between the arm and the underside of the flexible PCB).
- Then the 6 connections C can be heated so that they become soldered to the photodiode PCB.

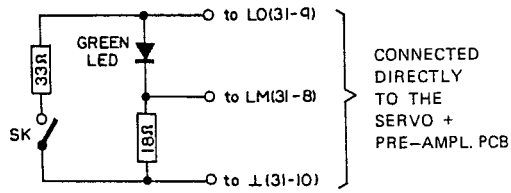
- Replacing the focusing unit

- Desolder the 2 connections of the flexible PCB on the focusing unit.
- Remove screw 2N X 10.
- The focusing unit can now be removed.
- When mounting the focusing unit, care should be taken that the focusing unit runs clear.
  The position of the focusing unit is fixed, adjustments are not possible.

MEASUREMENTS AND ADJUSTMENTS

● Check of the laser supply

The laser and the laser supply in IC6101 plus the monitor diode form a feedback system. A defect in the laser supply may result in the destruction of the laser. If, in that case, the laser (= complete RAFOC unit item no. 53) is replaced, the new laser will also become defective. However, it is impossible to check and repair a feedback system if a link is missing. For this reason the laser supply can be checked with the circuit below. The green LED replaces the laser, the voltage across the 18-Ohm resistor is fed back as monitor voltage, the 33-Ohm resistor and the switch servo the draw more current from the laser supply.



● LED GREEN e.g. COY 94 IV

The above circuit is connected to connector 31 via an extension cable instead of a flex print. The normal flex print is not suited for this purpose because of its high internal resistance.

● Code no. extension cable 4822 322 40066

- The above flex print out of connector 31 on the servo + pre-amplifier PCB.
- Connect the circuit via the extension cable to connector 31.
- Select the play mode by grounding $\overline{Si}$ (pin 20 of IC6101).

  Note: $\overline{Si}$ = 0, start initialization low, is the play mode.
- Measure the voltage LO (Laser Out) at test point 9.

  SK open: 1.8 V LO 2.3 V
  170 mV LM 220 mV
  The green LED emits little light.

  SK closed: 1.8 V LO 2.3 mV
  170 mV LM 220 mV
  The green LED emits little light.

- During the change-over from SK closed to SK open, the LED will emit more light for a short moment.
- The control sees to it that the same amount of current flows through the LED when SK is open and when SK is closed.

At $\overline{Si}$ = 1, in the STANBY state, LO = 0V ± 0.2V

● Repair procedure

Since laser, monitor diode and photodiodes are very sensitive to static charges, care should be taken that during measurements and adjustments the aids and yourself have a potential that is equal to that of the CD mechanism.

● Attention

When exchanging the RAFOC unit (item 53 on the CDM-2 exploded view drawing), the laser output potentiometer (3106) should be placed in mechanical mid-position to avoid damage to the laser.

● Adjusting the laser current

Coarse adjustment

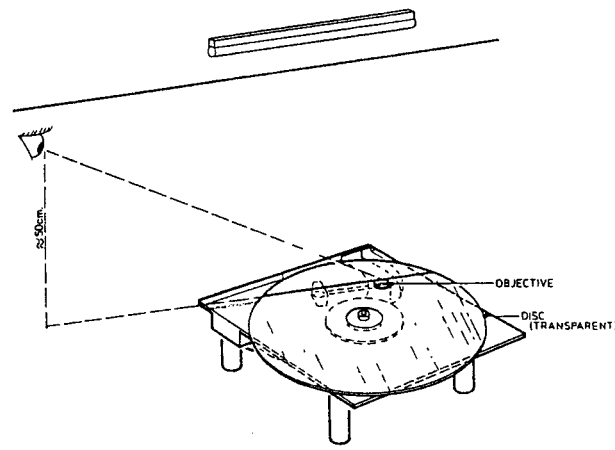
- Place potentiometer 3106 approximately in the centre.
- Place test disc 5, 4822 397 30096, on the turntable.
- Bring the player in Service position 1.
- Now the focus motor will max, 16X search for the focal point. On the display a "1" will appear if the focal point has been found.
- If this does not happen, turn potentiometer 3106 a bit to the left or to the right unit a "1" appears on the display.

Fine adjustment of the laser current

- Connect a DC voltmeter to test points 1 and 2 (= across resistor 3102).
- Play track 1 of test disc 4822 397 30096.
- Using potentiometer 3106, adjust the laser supply until the voltage across resistor 3102 is 50mV ± 5mV.

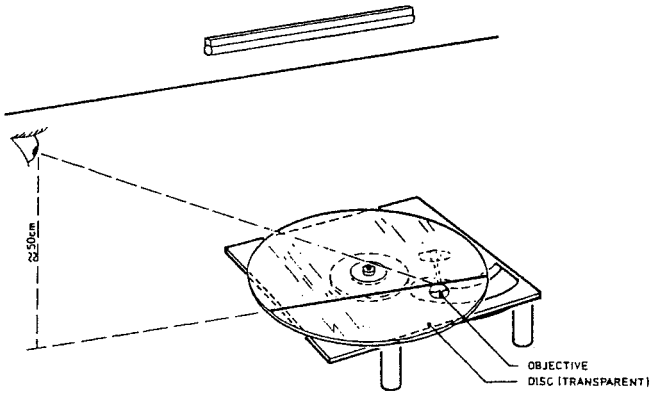
● Checking the angle setting

The angle setting can be checked with the glass-disc method which is explained below.



Put glass disc 4822 395 90204 on the turntable.
Make sure that the glass disc beds down well on the turntable.
Place the CD mechanism under a light source, under which there is a straight line (e.g. under a fluorescent tube with grid).
Set the arm to mid-position of its radial track.
Turn the mechanism until the arm is parallel to the line under the light source (see figure next page).
Look into the direction and in the extension of the line to the reflection there of the glass disc and in the objective.
These lines should not be apart more than 4 mm.
Place the CD mechanism so that the reflected line runs across the centre of the objective.

When the line that is reflected by the glass disc stays within the surface of the objective, the angle setting is correct.

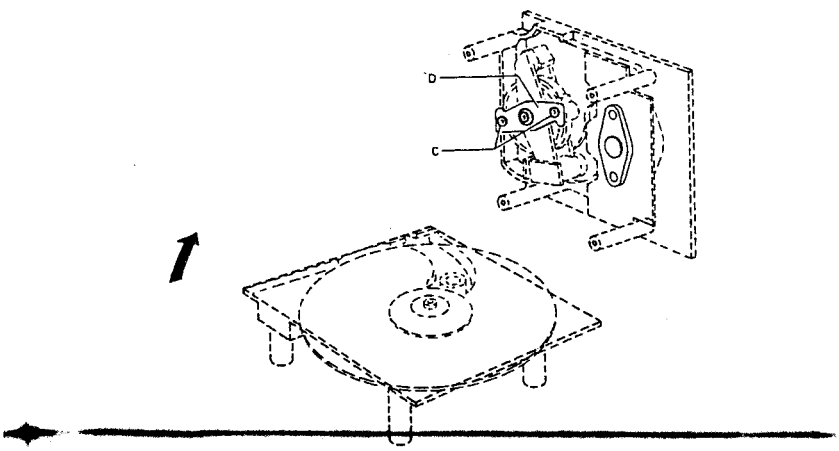


Turn the CD mechanism through 90° relative to the previous position. The arm must be kept in mid-position (see figure above).
Repeat the previous check.

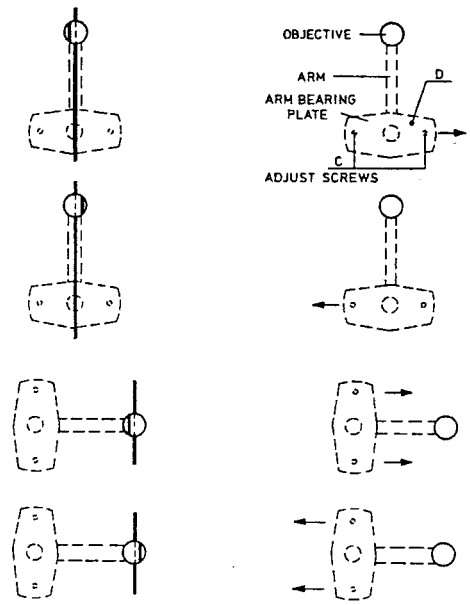
- Adjusting the angle setting

For adjusting the angle setting one or both of the two locking knocks for the bearing plate on pos. 62 must be broken.
By a check on the angle setting shows that the angle falls outside the telerance, the angle should NOT be adjusted for minimum deviation, but it should be adjusted within the tolerance.
The new setting should lie between the old setting and the optimum setting. After adjusting the setting , the friction of arm must be checked. This is done by means of a spring pressure gauge which is held against the magnet of the focusing unit.
The friction of the arm, measured over the entire meter reading, should not be greater than 25 mN.
When the friction appears to be too high, the RAFOC unit must be replaced and the angle between disc and light path adjusted.

The lock adjusted as follows:



Loosen screws C (see figure above) unit bearing plate D can be displaced. Correct the angle setting by moving the bearing plate into the direction shown in figure below. Tighten screws C, ensuring that the setting does not drift. Then double check the setting in two directions.



DETAILED MEASURING METHOD FOR THE SERVO + PRE-AMPLIFIER CIRCUIT II

HINTS

● Test discs

It is important that the test discs be treated with great care.
Any disturbances on the discs (black spots, finger-prints, etc.) are exclusive and are unamibiguously positioned. Damages may cause extra drop-outs etc., thus putting an end to the exclusivity of the intentional error on the disc. In that case it is not possible anymore to check, for example, the good functioning of the track detector.

● Measurements on op-amps

In electronic circuits, op-amps have frequently been used. The applications include amplifiers, filters, invertors and buffers.

In those cases where in one way or other feedback has been applied, the voltage difference at the differential inputs converges to zero.
This applies to both DC and AC signals.
The cause can be traced to the properties of an ideal op -amp ($Z = \infty$, $G = \infty$, $Z_o = 0$).
If one input of an op-amp is directly connected to ground, it will be virtually impossible to measure at the inverting and non-inverting inputs.
In such cases only the output signal will be measurable.

That is why in most cases the AC voltage at the inputs will not be given.
The DC voltages at the inputs are equal.

● Stimulating with "0" and "1"

During faultfinding it is sometimes necessary to connect certain points to ground or to supply voltage.
As a result certain circuits can be brought in a desired state, thus shortening the diagnosis time.
In a number of cases the relevant points are outputs of op-amps.
These outputs are short-circuit-resistant, that is, they can be brought to "0" or ground without problems.
The output of an op-amp, however, should never be connected directly to the supply voltage.

● Measurements on microprocessors

Inputs and outputs of microprocessors should never be connected directly to the supply voltage.
The inputs and outputs should only be brouhgt to "0" or ground if this is stated explicitly.

● Measurements with an oscilloscope

During measurements with an oscilloscope it is recommended to use a 1:10 test probe, since a 1:10 probe has a considerably smaller input capacitance than a 1:1 probe.

● Selection of the ground potential

It is very important to select a ground point that is as close as possible to the test point.

● Conditions for injection

- Injection of levels or signals from an external source should never take place if the relevant circuit has no supply voltage.
- The injected levels or signals should never be greater than the supply voltage of the relevant circuit.

● Continuous burning of the laser

- Bridge capacitor 2305 on the decoder PCB.
- Connect $\overline{Si}$ (= pin 20 of IC6101 on the servo + pre-amplifier PCB) to ground.
- Switch on the power supply.
  The laser now burns continuously.

● Indication of the test points

In the drawing of the diagrams and PCBs the test points are indicated by a number (e.g. ◇12◇) to which the measuring method refers.
In the following measuring method the symbol ◇ has been omitted for the test points indicated.

● GENERAL CHECK POINTS

In the detailed measuring method below, a number of general conditions, required for a properly functioning set, will not be mentioned.
Before the detailed measuring method is started, these general points should be checked.

a. Ensure that the disc and objective are clean (remove dust, fingerprints, etc.) and use undamaged discs.

b. Check that all supply voltages are present and that they have the correct values.

c. Check the good working of the microprocessor by means of the built-in test programme and servicing programme.

● Method:

See sub. self-test of the decoder μP in the service manual of the set.

● Initiating the service programme of the μP

For the initiation of teh service programme of the μP, see the service manual of the set.

PHOTODIODE SIGNAL PROCESSOR IC 6101

- $\overline{Si}$ (pin 20; test point 21)
  LO (pin 17; test point 9)
  LM (pin 16; test point 11)

– With the $\overline{Si}$ signal (= Start Initialization) the laser supply, among other things, is switched on.
When the $\overline{Si}$ signal is "low", the LO signal (= Laser Out) should be "high".
Via the LM signal (= Laser Monitor) the power supply for the laser diode is controlled.

Position of player	POWER ON	Servicing pos. 1*)	PLAY
$\overline{Si}$ signal	"high"	"low"	"low"
LO signal	"high"	"high"	"high"
LM signal	0 V	0,2V ± 0,05V	0,2V ± 0,05V

To ensure that the player stays in servicing pos. 1, there should be a disc on the turntable.

To check the laser supply, see "CHECK OF THE LASER SUPPLY", page 3-1.

- FE (pin 5; test point 26)

– The FE signal (= Focus Error) is used to drive the focusing unit.
When the Si signal goes "high", the focal point will be searched for.

– When the player is brought into servicing position 1 without disc, the objective will search 16x for the focal point.
At test point 26 the FE signal varies 16x between +3V and -3V.

– The FE signal ensures that the spot stays in focus.
When an error signal is injected, the FE signal will correct.
Bring the player in servicing position 2 (with disc on turntable).
Inject successively a voltage of +5V and -5V (= +1B and -1B) via a 200kΩ resistance to test point 25 and check the FE signal.

Signal injected test point 38	+5 V	−5 V
FE signal	Negative	Positive

- RD signal (pin 21; test point 24)
  HIGH-OHMIC MEASUREMENT

The RD signal (= READY) will go high when the starting procedure of IC6101 has been completed.

Position of player	POWER ON	Servicing pos. 1	PLAY
RD signal	"low"	"high"	"high"

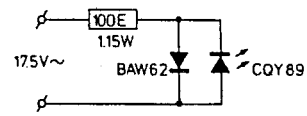
- D1 (pin 9; test point 4)
  D2 (pin 10; test point 6)
  D3 (pin 8; test point 7)
  D4 (pin 7; test point 8)

– The signals D1+D4 are the error signals from the photodetector circuits.

– When, in servicing position 1, the disc is moved, the focusing unit should keep in track.
When the disc is moving, there should be a changing signal on test points 4, 6, 7 and 8.

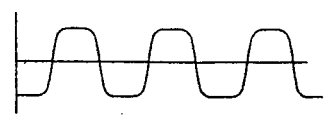
Check of the photodiodes

Connected the circuit below to an alternating voltage of 17.5V.



100 E - 1.15W – 4822 116 61098
BAW 62 – 4822 130 30613
CQY 89 – 4822 130 31332

Switch on the supply voltage and bring the player in the stand-by mode or in servicing position 0.
In this measurement, infrared diode CQY89 replaces the function of the laser diode.
When this diode is held above the objective unit, the infrared light falls on the 4 photodiodes.
When the 4 photodiodes are functioning, the following voltage form will be visible on test points 4, 6, 7 and 8 on the servo + pre-amplifier PCB.
(the amplitude depends on the distance between the IR diode and the objective).



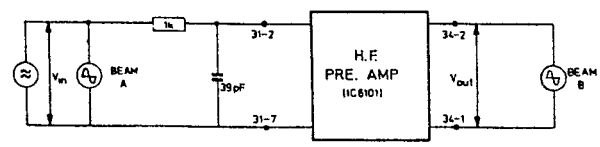
Position of the oscilloscope: 100 ms/div.

- HF-in (pin 3; test point 3)

– The HF-in signal (= High Frequency in) is the information signal from the 4 photodiodes.

Check of the HF amplifier in IC6101

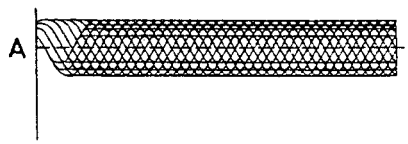
– Take the flexible PCB out of connector 31.
– Switch on the supply voltage.
– Inject a signal V-in of about 10mVpp, 50kHz, via the RC network, between connector pin 31-2 and connector pin 31-7 according to the diagram below.
– The output voltage between connector pins 34-14 and 34-13 should be about 1Vpp.



● HF-out (pin 27; measure at connector pin 34-14)

– The HF-out signal (= High-Frequency) is the amplified information signal for the decoder circuit.
During playback of test disc no. 5 (4822 897 30095), a so-called "eye pattern" should be present on test point 17 (see figure below).

– The HF signal should be present and stable in:
- the PLAY mode and in
- servicing position 3 after the lead-in track has been read.
- in servicing position 2 and during the reading of the lead-in track, the HF signal is present, but is not stable.



Position of the oscilloscope: 0,5 µs/div.
Amplitude about 1,5 Vpp.

● DET (pin 26)
$\overline{HFD}$ (pin 19; test point 23)
$\overline{TL}$ (pin 18; test point 16)

– The DET signal (= Detector) gives information on the level of the HF signal to the high-frequency Level/ Drop-out detector of IC6101.
– When the level of the HF signal is too low, the $\overline{HFD}$ signal (= High-Frequency Detector) will go "low".
– The $\overline{TL}$ signal (= Track Lost) will then go "low" in order to tell the servo µP that the tracking signals are unreliable.

● Method:
(Can only be used in a playing set)

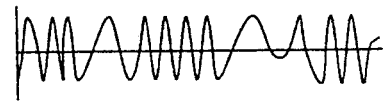
– Put test disc 5A (4822 397 30096) on the turntable.
– Switch on the power-supply switch and press the PLAY key.
– Play track number 10 or 15 and check the HFD signal at test point 23.
When drop-out pulses are present on the DET signal (pin 26), the HFD pulses should also be present at test point 23.
(Position of oscilloscope : 2 ms/div).

When the disc is slowly braked by hand. $\overline{TL}$ pulses will be visible at test point 16.

● RE 1 (pin 11; test point 18)
RE 2 (pin 12; test point 22)

– Signals RE1 and RE2 (Radial Error) are the control signals for the arm during tracking.

– In servicing position 2, the following signals should be visible at test point 18 and 22:



Position of the oscilloscope : 2ms/Div.-AC.
The frequency strongly depends on the eccentricity of the disc.

● $\overline{DODS}$ (pin 24; test point 19)

The $\overline{DODS}$ signal (= Drop Out Detector Suppression) avoids that Drop-Out signals ifluence the arm control during track jumping

Stand speler	POWER ON	Service pos. 3	PLAY	SEARCH
$\overline{DODS}$-signal	"laag"	"hoog"	"hoog"	"laag"

● SC (pin 25)
SC (= Start Capacitor)

HIGH-OHMIC MEASUREMENT

Pos. speler	SC (pen 25)
POWER ON	–4 V
PLAY	+5 V
Service pos. 1	+5 V

● FE lag (pin 6, test point 27)

– In service position 1 and in the PLAY mode, a voltage of about 100 mV is present at this point.
When the disc is moved by hand in service position 1, the signal will vary.

RADIAL ERROR PROCESSOR

Check the signals that come from the decoder μP and from photodiode signal processor IC6101

- RE-dig (pin 3; test point 37)

— With the RE dig signal (= Radial Error digital = Radial Polarity), the movement of the arm is controlled/ corrected in case of track jumping and bumping against the player).

— In servicing position 3 or in the PLAY mode a square wave should be present at test point 37.
Because of frequency variations this square wave is hard to trigger.

— In the positions PREVIOUS and NEXT the frequency of the square wave decreases.

- DAC (pin; test point 38)

— With the DAC signal (= Digital to Analogue Converter) the track jumping speed is controlled.
This signal is derived from the signals B0 + B3 coming from the decoder μP.

- RE (pin 7; test point 39)

— With the RE signal (= Radial Error) the light spot is kept on the track.
When an error signal is injected, the RE signal will correct.
— Bring player in servicing position 3.

— Inject successively a voltage of +5 V and -5 V (= +1B and -1B), via a 120 kΩ resistance, to pin 5 of IC6104B and check the RE signal.

Signal injected test point 25	+5 V	−5 V
FE signal	Negative	Positive

- RE lag (pin 8; test point 41)

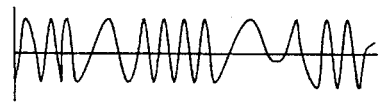
Capacitor 2156 in the RE-lag circuit has a memory function.
It memorizes the degree of inclination of the disc.
When a jump is made to a certain track on the disc, the memory should be cleared.
This takes place by the decoder μP ($\overline{\text{RPU}}$ signal) via transistor 6109.

During track jumping (SEARCH), slow pulses should be visible at test point 43 (position of the oscilloscope 0.1 ms/Div).
In that case pulses should also be visible on the collector of transistor 6109.

- RE 1 (pin 11; test point 18)
  RE 2 (pin 12; test point 22)

— Signals RE1 and RE2 (Radial Error) are the control signals for the arm during tracking.

— In servicing position 2, the following signals should be visible at test point 18 and 22.



Position of the oscilloscope : 2ms/Div.-AC.
The frequency strongly depends on the eccentricity of the disc.

- B0 (pin 12; test point 36)
  B1 (pin 13; test point 34)
  B2 (pin 14; test point 33)
  B3 (pin 15; test point 32)

With the B0 + B3 signals
• The radial control is switched on.
• The level on the DAC output is controlled.
— In the SEARCH mode, there should be activity on all 4 test points.

	STOP	PLAY	SERVICING POSITION 0, 1, 2	SERVICING POSITION 3
B0	"low"	"high"	"low"	"high"
B1	"high"	"high"	"high"	"high"
B2	"high"	"high"	"high"	"high"
B3	"low"	"low"	"low"	"low"

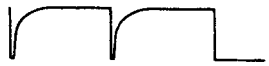
Adjusting the offset on RAD + (test point 40)

— Render B0, B1, B2 and B3 low by grounding them.
— Measure at test point 40 relative to ground.
— Adjust potentiometer 3165 for a volgate of 0V ± 0.1V at test point 40.

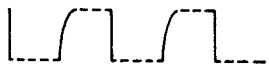
- C agc (pin 5, test point 35)
  Adjusting the offset on C agc (test point 35)
— Connect pins 18 and 19 to ground.
— Measure with a high-ohmic voltmeter at test point 35 relative to the -1C supply voltage.
— Adjust potentiometer 3167 until the voltage at test point 35 is 4.5V ± 0.1V relative to the -1C supply voltage.

- MC (test point 12)
  The MC signal (= Motor Control) is used to control the speed of the turntable.
— In the standby position (= power on), a signal as shown in the figure below is present at test point 12. The frequency is 88.2 kHz.
— With a disc on the turntable and with the player in service position 3 or in the PLAY mode, a signal as shown in the figure below should be present at test point 12. The frequency is 44,7 kHz.

POSITION: STAND BY



POSITION: PLAY (BEGINNING)



POSITION: PLAY (NORMAL)

When the MC signal is correct and is released by the RD signal, the turntable motor must be rotating.
(See also "Check of the motor control Hall (control) page 3-1-a)

- VC (connector point 36-1)
  Fast check
- Place a disc on the turntable. The voltage at connector point 36-1 will be about -2.5 V during playback of the first piece of music (inside of the disc) and about -1.5 V during the last piece (outside of disc.)
- For dynamically adjusted motors:
  Vc = 0 > Vc > -1.7V

DETAILED MEASURING METHOD FOR THE DECODER CIRCUIT

HINTS

- Test discs

It is important to treat the test discs with great care. Any disorders on the discs (black spots, fingerprints, etc.) are exclusive and unambiguously positioned. Damage may cause additional drop-outs etc. rendering the intentional errors no longer exclusive. In that case it will no longer be possible to check e.g. proper working of the track detectors.

- Measurements on op-amps

In the electronic circuits op-amps have been used frequently. Some of the applications are amplifiers, filters, inverters and buffers.

In those cases where in one way or other feedback has been applied, the voltage difference at the differential inputs converges to zero. This applies to both DC and AC signals. The cause can be traced to the properties of an ideal op-amp ($Z_i = \infty$, $G = \infty$, $Z_o = 0$). If one input of an op-amp is directly connected to ground it will be virtually impossible to measure at the inverting and the non-inverting inputs. In such cases only the output signal will be measureable.

That is why in most cases the AC voltage at the inputs will not be given. The DC voltages at the inputs are equal.

- Stimulation with "0" and "1"

During troubleshooting sometimes certain points should be connected to ground or supply voltage. As a result certain circuits can be brought into a desired state thus shortening the diagnosis time. In a number of cases the related points are outputs of op-amps. These outputs are short-circuit-resistant, i.e. they can be brought to "0" or ground without problems.
The output of an op-amp, however, should never be connected directly to the power supply voltage.

- Measurements on microprocessors

Inputs and outputs of microprocessors should never be connected directly to the power supply voltage. The inputs and outputs should only be brought to "0" or ground if this is stated explicity.

- Measurements with an oscilloscope

During measurements with an oscilloscope it is recommended to measure with a 1:10 test probe, since a 1:10 probe has a considerably smaller input capacitance than a 1:1 probe.

- Selection of ground potential

It is very important to select a ground point that is as close as possible to the test point.

- Conditions for injection

- Injection of levels or signals from an external source should never take place if the related circuit has no supply voltage.
- The injected levels or signals should never be greater than the supply voltage of the related circuit.

- Continuous burning of the laser

- Bridge capacitor 2315 on the decoding panel.
- Connect Si (= pin 20 if IC6101 on the servo + preampl. panel) to ground.
- Switch on the supply voltage.
- Now the laser will burn continuously.

GENERAL CHECKPOINTS

In the detailed measuring method below a number of general conditions, required for a properly functioning set, will not be mentioned. Before the detailed measuring method is started, these general points should first be checked.

a. Ensure that disc and objective are clean (remove dust, fingerprints, etc.) and work with undamaged discs.

b. Check if all supply voltages are present and if they have the correct values.

c. Check the good working of the two microprocessors by means of the servicing programme.

- Initiation of the servicing programme of the μP

— Servicing position "0"
Short-circuit pins 3 and 4 and pins 8 and 9 of IC8(ICM 4066BP) and turn the POWER switch on while pressing the DISPLAY key. When "LIM S" appears in the display (FL1), release the short-circuits.
In this state it is possible to move the arm by means of the F FWD and F BWD keys with a minimum torque to the outside and the inside resp. This enables a check of the arm sweep across the disc.

— Servicing position "2"
From servicing position "0" the player can be brought in servicing position "2" by depressing the F SKIP key.

In this state the laser emits light and the objective starts to focus. Place disc on turntable.

When no disc has been inserted the objective goes 16 x to and fro. Then the player reassumes servicing position "0".

- The turntable motor starts to run

On the display appears "2".

In preparation of the transition to servicing position "3" the arm is sent to the centre of the disc.

— Servicing position "3"

To be reached by depressing the F SKIP key after servicing position "2" has been reached.

The radial control is switched on. The subcode information is ignored. $\overline{\text{MUSB}}$ is high so that the music information is released.

On the display appears "3"

(Dependent on the length of the lead-in track music will be reproduced after approx 1 min.)

In this state it is possible to move the arm by means of the F FWD and F BWD keys to the outside and to the inside resp. Now the motion is controlled by the μP and the arm moves by steps of 64 tracks as long as the key is depressed.

If one of the servicing positions 2 or 3 is disturbed (e.g. braking or removing the disc) the player reassumes servicing position "0".

The servicing programme can be left by switching the main switch (POWER ON/OFF) off and on. (Hardware reset).

I DECODER μP (MAIN CB IC3)

- Reset (pin 17)

When the supply voltage is switched on, a positive pulse shoud be present.

- X-TAL out (pin 16)

The frequency of this signal should be 6 MHz.

- $\overline{\text{Si}}$ (pin 23)

When the $\overline{\text{Si}}$ signal (= Start Initialization) is "low", the laser supply and the focusing control are switched on.

Position of player	POWER ON	Servicing pos. 2	PLAY
$\overline{\text{Si}}$ signal	"high"	"low"	"low"

- RD (pin 33)

The RD signal goes "high" for a short time after switching on the power supply of the Photodiode signal processor. That "high" situation (>0.2 sec) is used to start up the SWAB/SSM input port of Decoder-A IC. After that the turntable motor control will be switched on.
The turntable motor is controlled by tne MC-signal (test point 60).
To check MC, see: "Decoder-A IC".

- B0 (pin 26)
  B1 (pin 27)
  B2 (pin 10)
  B3 (pin 2)

With the B0 + B3 signals
- O The radial control is switched on.
- O The level on the DAC output is controlled.
- — In the SEARCH mode, ther should be activity on all 4 test points.
- — In the following positions the signals B0 + B3 are stable:

signal	STOP	PLAY	Service pos. 0,2	Service pos. 3
B0	"low"	"high"	"low"	"high"
B1	"high"	"high"	"high"	"high"
B2	"high"	"high"	"high"	"high"
B3	"low"	"low"	"low"	"low"

- TO (pin 12)

- — The TO signal (Track Loss) is used to tell the μP that track loss threatens. The μP then can give correction signals with B0 ÷ B3.
- — In the "SEARCH" mode, or when the player is bumped, there are pulses on test point 16.

- Ti (pin 13)

The Ti signal (= Radial Error Digital = radial devia-tion) is used to determine the place of the arm relative to the track and to check/correct in case of track jumping or bumping against the player.

In servicing position 3 or in the PLAY or PAUSE mode, a square wave should be present on test point 40.
Because of frequency variations, this square wave is hard to trigger.

● $\overline{\text{DODS}}$ (pin 24)

The $\overline{\text{DODS}}$ signal (= Drop Out Detector Suppression) avoids that Drop-Out signals influence the arm control during track jumping.

POSITION PLAYER	POWER ON	SERVICE POSITION 3	PLAY	SEARCH, PAUSE
$\overline{\text{DODS}}$ SIGNAL	"HIGH"	"HIGH"	"HIGH"	

II DECODER-A IC

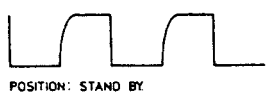
● Check the MC signal (pin 17)

– In stand-by mode, the MC signal (Motor Control) corresponds to the figure below.

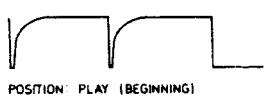
Note:
The repetition time of the MC signal is 11.3 μsec.

– Place a disc on the turntable.
– In position PLAY, the MC signal corresponds to the figure below.

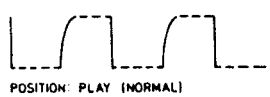
Note:
During start-up the duty cycle is 98%, then the duty cycle of the signal becomes about 50%.



POSITION: STAND BY



POSITION: PLAY (BEGINNING)



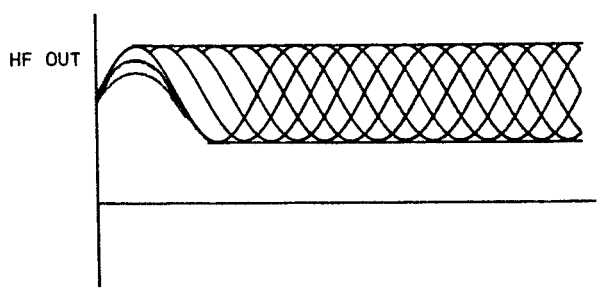
POSITION: PLAY (NORMAL)

● Check the HF signal on pin 25 (eye pattern)

– Insert a disc.
– The HF signal should be present and be stable in the PLAY mode and in.
– During reading of the lead-in track the HF signal is not stable.

Position of oscilloscope 0.5 µs/DIV.

Amplitude ≈ 1,5 V_{pp}

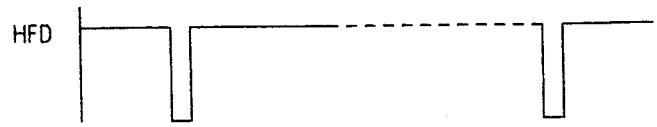


● Check the HFD signal on pin 26

– Insert a disc.
– In the PLAY mode HFD signal is "high"; however, minor pulses may be present and in cause of disorders on the disc.

– During playback of track no. 15 of test disc 5A HFD pulses are visible.

Position of the oscilloscope 5 ms/DIV



MDA.00240

● Mute (pin 33)

Check the Mute-signal. This is "low" in positions: PAUSE; NEXT or PREVIOUS, when jumping from one track to another. Fast SEARCH, when the Search button is kept depressed for some time.

● Check the CEFM signal (pin 27)

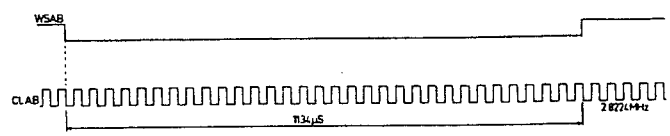
– Place a disc on the turntable.
– In stand-by mode (only the mains switch is depressed), the frequency lies between 2.82MHz and 5.64MHz.
– In the position PLAY the frequency is 4.32MHz.

● Check the Xin signal (pin 19)

– The Xin frequency is 11.2896MHz.

● Check the timing signals meant for Filter-B IC

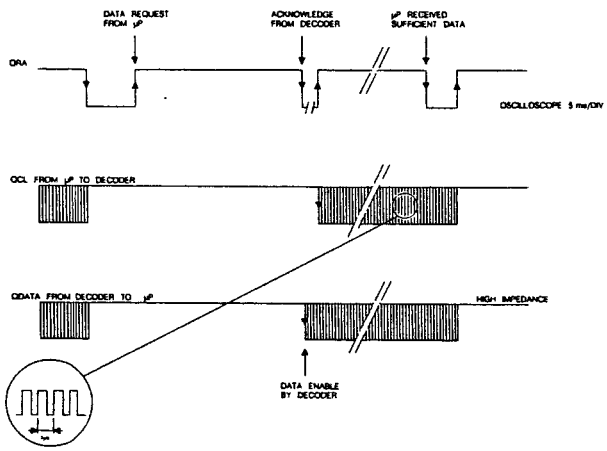
– Place disc on the turntable.
– Select position PLAY.
– Trigger the oscilloscope with the WSAB signal (pin 39).
– Check signals:
WSAB at test point 64 (pin 39)
(Word Select from Decoder-A to filter-B)
CLAB at test point 65 (pin 38)
(Clock from Decoder-A to Filter-B)
and their interrelation.
– There must be activity at test point 66 (pin 37), DAAB signal (DATA from Decoder-A to Filter-B).



- Check the Q-channel signals

- Place a disc on the turntable.
- The following positions: Position PLAY
- Trigger on the QRA signal (Q-channel Requrest Acknowledge); pin 30.
- Check signals QRA (pin 30)
  QCL (pin 31)
  (Q-channel-clock)
  and their interrelation.
- There should then be activity at (pin 29) QDA (Q-channel Data).

Note:
The QRA request is initiated by decoder μP (QRA "high").
Then Decoder-A answers this request (QRA goes "low"). With the next leading clock pulse (QCL) the QRA signal is rendered "high" again by the decoder μP.
As soon as the decoder μP has taken in enough information via QDA, QRA will go low again. That is why the QRA times vary each time.



- Check the SWAB/SSM signal (pin 33) = Start-Stop turntable motor

- Motor start pulse when pin 33 is "high" for >0.2sec.
- Motor stop pulse when pin 33 is "low" for >0.2sec.

Note:
After the motor start pulse, SWAB information (Subcoding Word clock) will become visible at this point. The period time of that signal is 136 μsec.

- Check the DEEM signal (test point 61; pin 32)

- Place test disc 5 on the turntable.
- During playback of track no. 14 (recorded without PRE-EMPHASIS), the DEEM signal should be "low".
- During plaback of track no. 15 (recorded with PRE-EMPAHSIS), the DEEM signal should be "high".

III DAC IC (Dual Digital Analog Converter)

- Check the signals between Decoder-A IC and DAC IC

- See sub. "III Decoder-A IC":
  * Check the timing signals between II Decoder-A IC and DAC IC.

- Check the output of the op-amp after DAC IC

- Place a disc on the turntable.
- In position PLAY or in SERVICE POSITION 3, the analog (music) signal should be present at the output of the op-amp, after the lead-in track has been read.

ELECTRICAL MAIN PARTS LIST

REF.NO.	PART NO.	DESCRIPTION
=== IC ===		
	87-001-132-019	IC,ICP-N38
	S0-550-863-000	IC,L272BH
	87-020-738-019	IC,LB1630
	84-735-619-010	IC,LC6512A-3597
	87-020-096-019	IC,M4066BP
	87-001-170-019	IC,M5290P
	84-735-616-018	IC,MAB8441P/T105
	87-001-393-010	IC,MB81416-15
	87-020-758-019	IC,NJM2068SD
	S7-830-068-200	IC,NJM4560
	87-001-245-019	IC,NJM79L15A
	84-735-617-018	IC,SAA7210P
	84-735-618-018	IC,TDA1541
	S7-814-011-200	IC,TDA5708/C3
	S4-357-011-200	IC,TDA5709
=== TRANSISTOR ===		
	89-106-837-019	TRANSISTOR,2SA683(S)
	89-110-154-089	TRANSISTOR,2SA1015(Y)
	89-113-584-010	TRANSISTOR,2SA1358Y
	89-114-881-019	TRANSISTOR,2SA1488
	89-313-833-019	TRANSISTOR,2SC1383R
	89-318-154-089	TRANSISTOR,2SC1815(Y)
	89-328-785-689	TRANSISTOR,2SC2878A/B
	89-338-511-019	TRANSISTOR,2SC3851
	S7-962-011-600	TRANSISTOR,BC328-25
	S7-961-011-600	TRANSISTOR,BC338-16
	S8-963-021-500	TRANSISTOR,BC848B
	S8-979-021-500	TRANSISTOR,BC858B
	87-026-219-019	TRANSISTOR,DTA144ES
	87-026-218-019	TRANSISTOR,DTC144ES
=== DIODE ===		
	S8-399-011-300	DIODE,1N4148
	87-020-110-019	DIODE,1SS177
	87-020-123-019	DIODE,DS446
	87-020-945-019	DIODE,MPG06D
	87-027-393-019	DIODE,ZENER HZ-4C2
	87-027-323-019	DIODE,ZENER HZ22-2L
	87-027-286-019	DIODE,ZENER HZ5C1
	87-027-399-019	DIODE,ZENER HZ7A3L
	S6-752-068-300	DIODE,ZENER HZ7C2 7V5
=== MAIN CIRCUIT BOARD SECTION ===		
PCB-A	*	MAIN CIRCUIT BOARD
C1	★87-018-047-010	CAP,CERA-SOL 0.01UF
C2	★87-018-047-010	CAP,CERA-SOL 0.01UF
C3	★87-018-047-010	CAP,CERA-SOL 0.01UF
C4	★87-018-047-010	CAP,CERA-SOL 0.01UF
C5	★87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M78,M755)
C6	★87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M78,M755)
C7	★87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M78,M755)
C8	★87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M78,M755)
C9	★87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M78,M755)
C101	★87-010-262-019	CAP,ELECT 3300UF 16V SME
C102	★87-010-262-019	CAP,ELECT 3300UF 16V SME
C103	★87-010-393-010	CAP,ELECT 100-35
C104	★87-010-247-010	CAP,ELECT 100-50 SME
C105	★87-010-384-010	CAP,ELECT 100-25V
C106	★87-010-384-010	CAP,ELECT 100-25V
C107	★87-010-378-010	CAP,ELECT 10-16V
C108	★87-010-378-010	CAP,ELECT 10-16V
C109	★87-010-378-010	CAP,ELECT 10-16V
C110	★87-010-379-010	CAP,ELECT 22-16V SME
C111	★87-010-246-010	CAP,ELECT 47-35V
C112	★87-010-546-010	CAP,ELECT 0.33-50 SME
C113	★87-010-260-010	CAP,ELECT 47-25V
C114	★87-010-112-010	CAP,ELECT 100-16V
C115	★87-010-380-010	CAP,ELECT 47-16V
C116	★87-010-265-010	CAP,ELECT 33-16V
C117	★87-018-024-010	CAP,CERA-SOL 47PF
C119	★87-010-403-010	CAP,ELECT 3.3-50V SME
C120	★87-010-521-010	CAP,ELECT 6.8-25V
C123	★87-018-022-010	CAP,CERA-SOL S 39PF
C124	★87-018-022-010	CAP,CERA-SOL S 39PF
C125	★87-010-380-010	CAP,ELECT 47-16V
C126	★87-018-047-010	CAP,CERA-SOL 0.01UF
C127	★87-010-380-010	CAP,ELECT 47-16V
C128	★87-018-047-010	CAP,CERA-SOL 0.01UF
C129	★87-018-024-010	CAP,CERA-SOL 47PF
C130	★87-018-024-010	CAP,CERA-SOL 47PF
C131	★87-010-379-019	CAP,ELECT 22-16V
C132	★87-010-380-010	CAP,ELECT 47-16V
C133	★87-018-047-010	CAP,CERA-SOL 0.01UF
C134	★87-010-404-010	CAP,ELECT 4.7-50V SME
C135	★87-018-220-019	CAP,CERA-SOL 33P
C136	★87-018-220-019	CAP,CERA-SOL 33P
C137	★87-010-380-010	CAP,ELECT 47-16V
C138	★87-018-047-010	CAP,CERA-SOL 0.01UF
C140	★87-018-047-010	CAP,CERA-SOL 0.01UF
C141	★87-018-047-010	CAP,CERA-SOL 0.01UF
C144	★87-010-380-010	CAP,ELECT 47-16V
C145	★87-010-380-010	CAP,ELECT 47-10V
C146	★87-018-047-010	CAP,CERA-SOL 0.01UF
C147	★87-010-380-010	CAP,ELECT 47-16V
C148	★87-018-047-010	CAP,CERA-SOL 0.01UF
C149	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C150	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C151	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C152	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C153	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C154	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C155	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C156	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C157	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C158	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C159	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C160	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C161	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C162	★87-018-209-010	CAP,CERA-SOL SS 0.1UF
C163	★87-014-053-010	CAP,PP 680P
C164	★87-018-047-010	CAP,CERA-SOL 0.01UF
C165	★87-010-384-010	CAP,ELECT 100-25V
C166	★87-018-047-010	CAP,CERA-SOL 0.01UF
C171	★87-010-401-019	CAP,ELECT 1-50V
C172	★87-010-401-019	CAP,ELECT 1-50V
C175	★87-018-047-010	CAP,CERA-SOL 0.01UF
C176	★87-018-047-010	CAP,CERA-SOL 0.01UF
C177	★87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M78,M755)
C178	★87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M78,M755)
C179	★87-010-380-010	CAP,ELECT 47-16V
C180	★87-010-380-010	CAP,ELECT 47-16V
C181	★87-010-380-010	CAP,ELECT 47-16V
C182	★87-010-380-010	CAP,ELECT 47-16V
C183	★87-010-038-010	CAP,ELECT 22-25V
C184	★87-018-047-010	CAP,CERA-SOL 0.01UF

REF.NO.	PART NO.	DESCRIPTION
C185	*87-018-047-010	CAP,CERA-SOL 0.01UF
C186	*87-018-047-010	CAP,CERA-SOL 0.01UF
C187	*87-010-380-010	CAP,ELECT 47-16V
C188	*87-010-378-010	CAP,ELECT 10-16V
C189	*87-018-047-010	CAP,CERA-SOL 0.01UF
C190	*87-018-047-010	CAP,CERA-SOL 0.01UF
C191	*87-010-380-010	CAP,ELECT 47-16V
C192	*87-010-380-010	CAP,ELECT 47-16V
C193	*87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M45)
C194	*87-018-047-010	CAP,CERA-SOL 0.01UF(DX-M45)
CJ1	87-049-667-010	PIN JACK 2P(LINE OUT)(DX-M45)
EMI1	*87-030-131-019	FILTER NOISE,0.01(DX-M78,M755)
EMI2	*87-030-131-019	FILTER NOISE,0.01(DX-M78,M755)
EMI3	*87-030-131-019	FILTER NOISE,0.01(DX-M78,M755)
⚠FR1	87-029-070-010	RES,FUSIBLE 2.2 1/4W
⚠FR2	87-029-125-019	RES,FUSIBLE 1 1/4W
⚠FR3	87-029-125-019	RES,FUSIBLE 1 1/4W
⚠FR4	87-029-017-019	RES,FUSIBLE 10 1/4W
⚠FR7	87-029-125-019	RES,FUSIBLE 1 1/4W
⚠FR8	87-029-125-019	RES,FUSIBLE 1 1/4W
L1	*87-005-239-019	COIL 100UH
L2	*87-008-372-019	FILTER EMI,BLOI RNI
L3	*87-008-372-019	FILTER EMI,BLOI RNI
L4	*87-118-372-019	FILTER EMI,BLOI RNI
L5	*84-720-608-010	COIL,OSC FL
LPF1	*84-735-624-010	LPF,BL-21T0
LPF2	*84-735-624-010	LPF,BL-21T0
X1	*87-008-378-019	OSC,CER, CSA3-OMHZ
X2	*87-008-380-019	OSC,CER, CSA6-OMHZ
X3	*84-735-623-019	XTAL 11,2896MHZ
=== FRONT CIRCUIT BOARD SECTION ===		
PCB-B	*	FRONT CIRCUIT BOARD
FL1	84-735-615-010	FL,CPF2282
SW3	87-031-771-019	SW,TACT(B.SKIP)
SW4	87-031-771-019	SW,TACT(F.SKIP)
SW5	87-031-771-019	SW,TACT(MEMORY/CHECK)
SW6	87-031-771-019	SW,TACT(PLAY/REPLAY)
SW7	87-031-771-019	SW,TACT(STOP/CLEAR)
SW8	87-031-771-019	SW,TACT(PAUSE)
SW9	87-031-771-019	SW,TACT(F.BWB)
SW10	87-031-771-019	SW,TACT(F.FWD)
SW11	87-031-771-019	SW,TACT(REPEAT)
SW12	87-031-771-019	SW,TACT(DISPLAY)
SW13	87-031-771-010	SW,TACT(OPEN/CLOSE)
=== POWER CIRCUIT BOARD SECTION === (DX-M45 ONLY)		
PCB-C	*	POWER CIRCUIT BOARD
⚠	*82-304-743-010	TERMINAL 1P
⚠L6	*87-030-126-010	FILTER NOISE LF/4A09
=== SWITCH CIRCUIT BOARD SECTION ===		
PCB-D	*	SWITCH CIRCUIT BOARD
⚠SW1	81-541-618-010	SW,PUSH(STANDBY/ON)
SW2	84-772-613-010	SW,SLIDE(TIMER PLAY)(DX-M78,M755)
=== SERVO CIRCUIT BOARD SECTION ===		
2111	*S3-089-002-500	POLCAP 470/50V
2136	*S3-089-002-500	POLCAP 470/50V
2150	*S4-618-360-200	CAP 3N6/16V
2151	*S4-618-360-200	CAP 3N6/16V
3106	*S4-836-210-200	POT.METER 1K
3146	*S4-836-222-300	POT.METER 22K

REF.NO.	PART NO.	DESCRIPTION
=== MISCELLANEOUS ===		
	84-732-613-010	FLAT CABLE,13P,500(DX-M78,M755)
⚠	*87-034-736-010	CORD,AC(E)(DX-M45E)
⚠	*87-034-975-010	CORD,AC(K)(DX-M45K)
⚠	*87-085-185-010	BUSHING AC CORD(DX-M45)
M1	S1-055-400-200	MOTOR ASSY(TRAY)
M2	S1-028-521-100	MOTOR ASSY(DC)
⚠PT1	84-735-608-018	TRANSFORMER E(DX-M45E)
⚠PT1	84-735-609-018	TRANSFORMER K(DX-M45K)
S1	*S1-083-685-100	SWITCH(OPEN)
S2	*S1-083-685-100	SWITCH(CLOSE)

Combination Circuit Board A 84-735-610-210

PCB-A 84-739-621-010

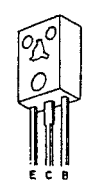
PCB-C 84-739-623-010 (DX-M45 ONLY)

Combination Circuit Board B 84-739-610-010

PCB-B 84-739-622-010

PCB-D 84-739-624-010

2SA683
2SA1015
2SC1383
2SC1815
2SC2878



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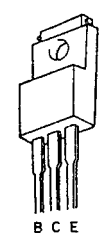
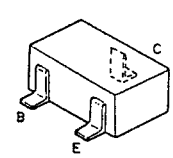


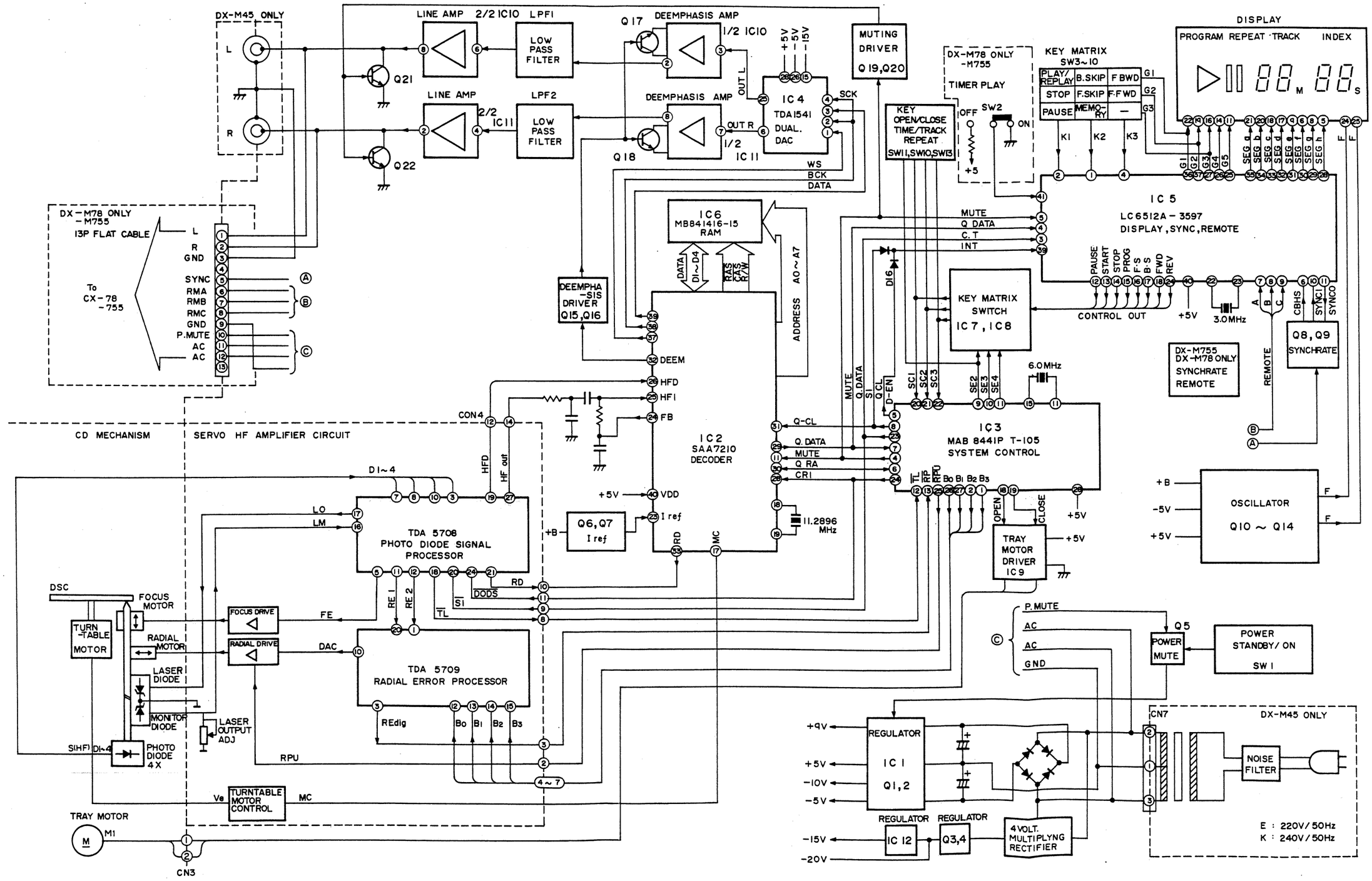
2SA1488
2SC3851

BC338-16
BC328-25

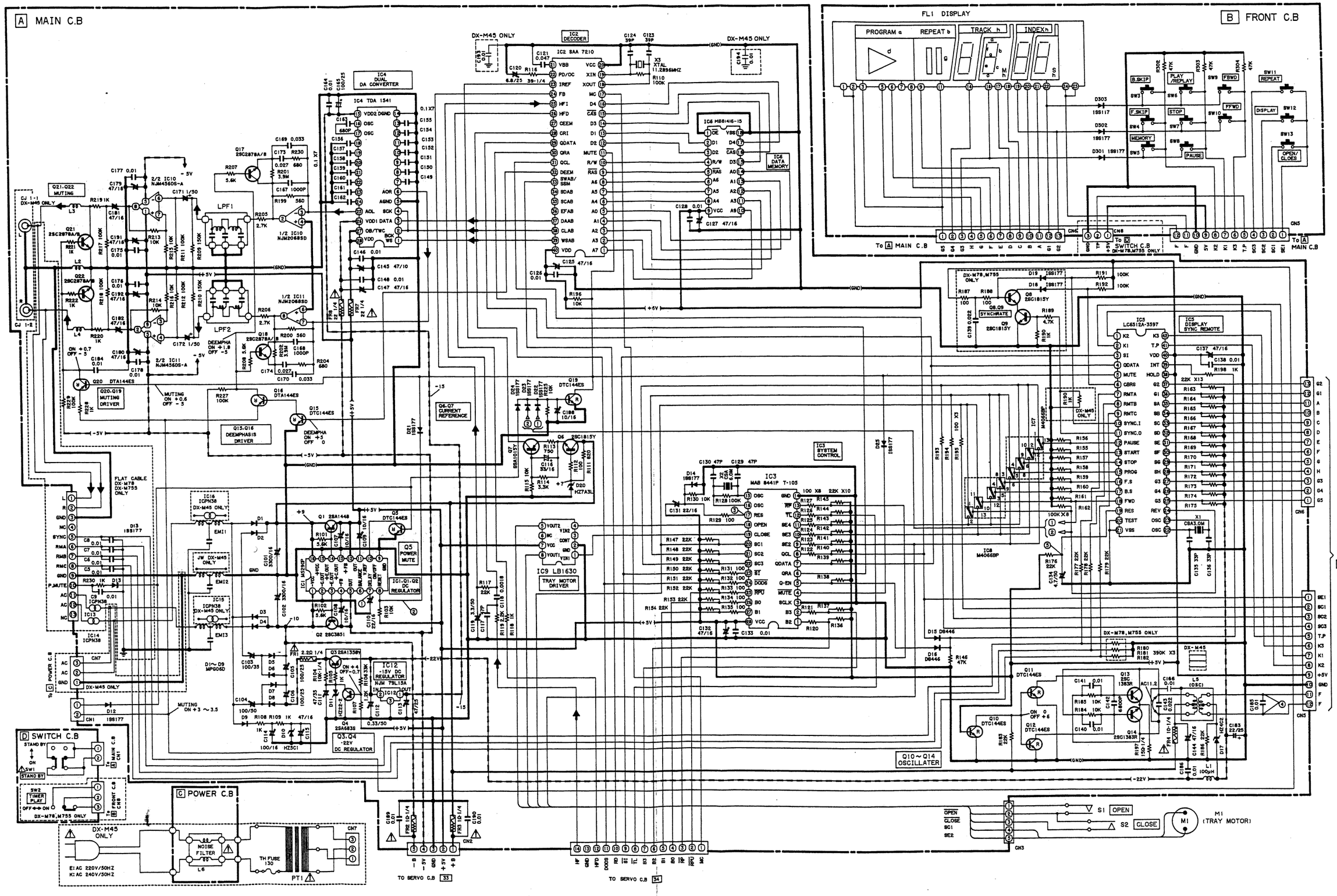


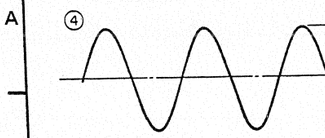
BC848B
BC858B

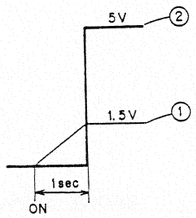
BLOCK DIAGRAM

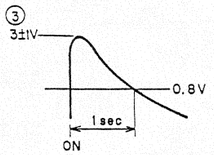


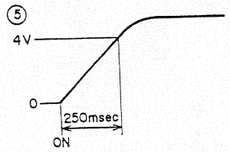
SCHEMATIC DIAGRAM – 1

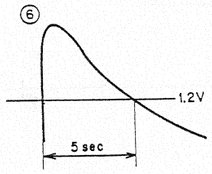


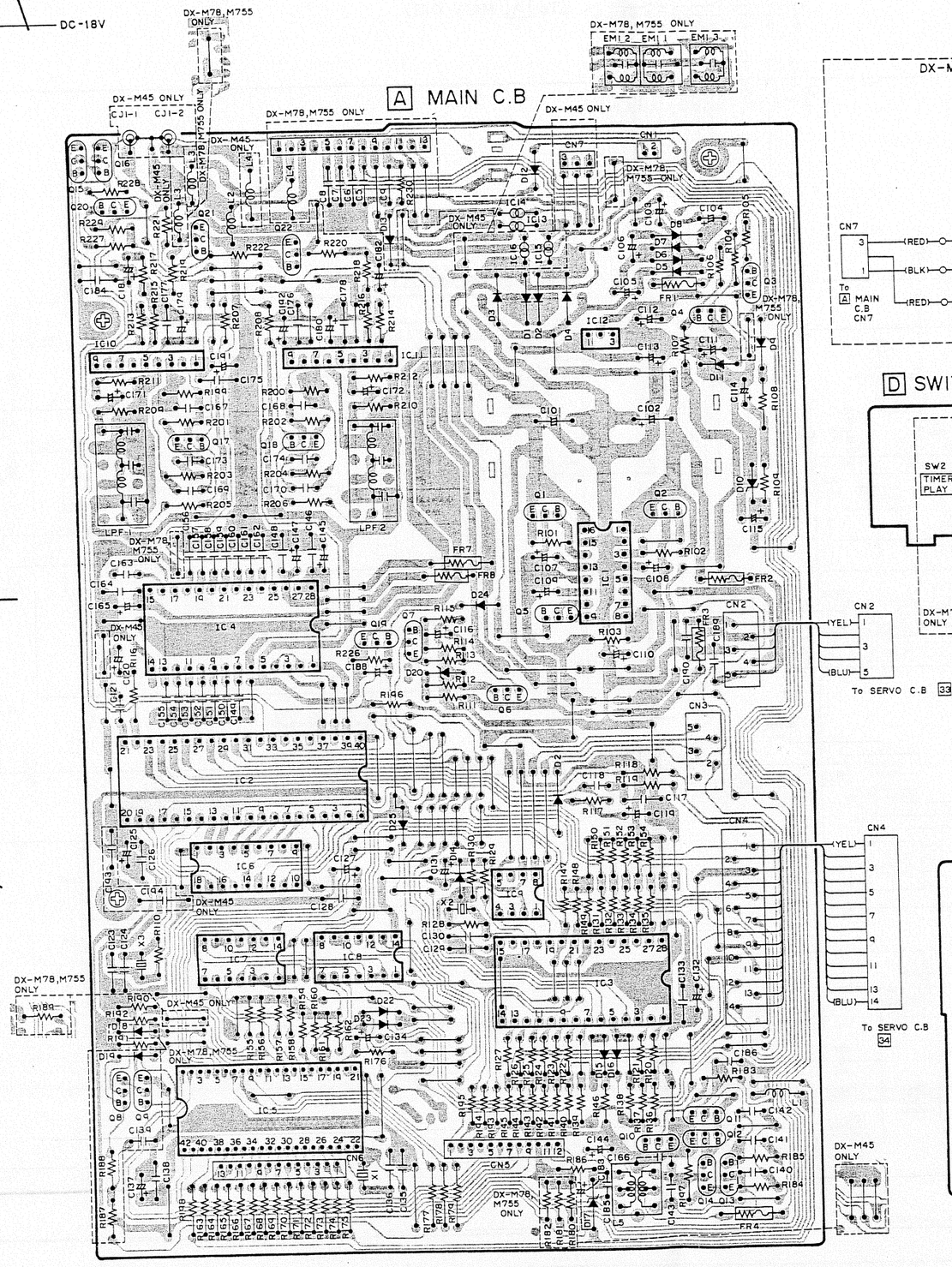

④
AC 2.2V
DC-18V

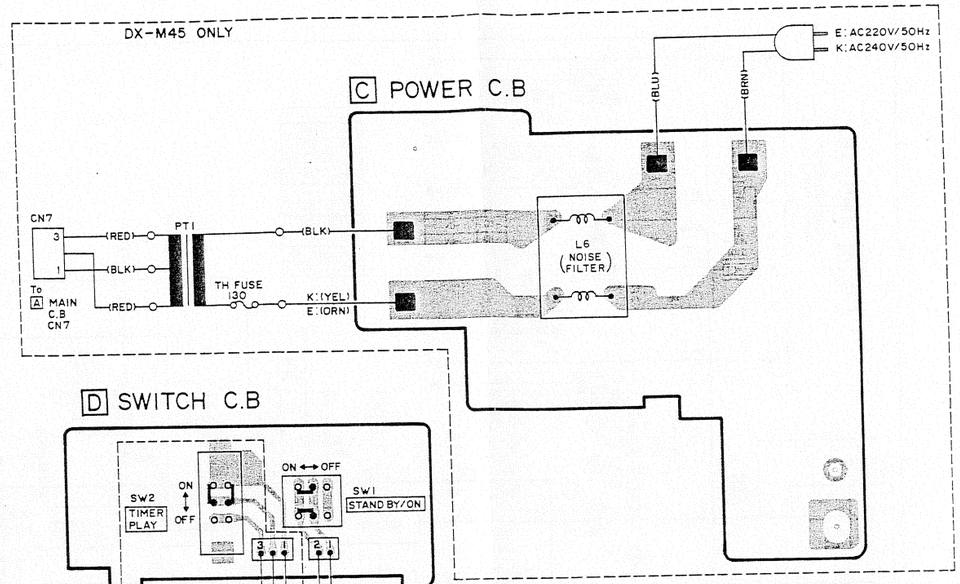

5V
②
1.5V
①
1sec
ON

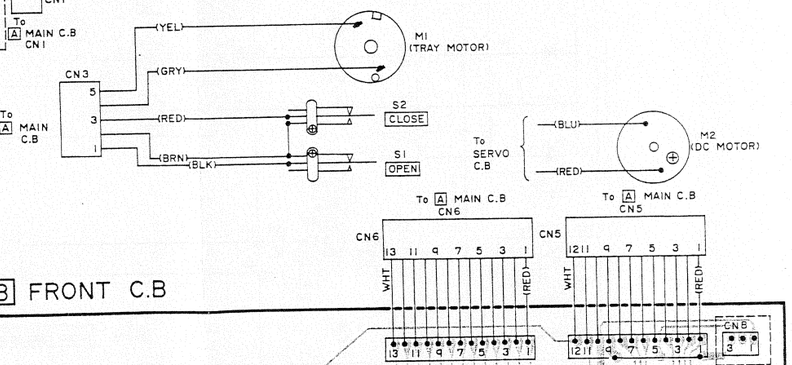

③
3±1V
0.8V
1sec
ON

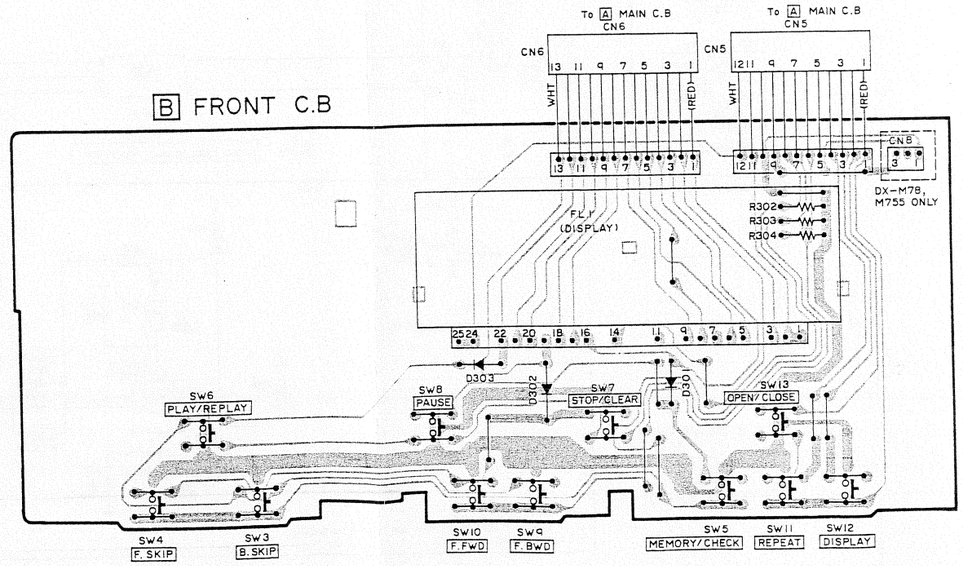

⑤
4V
0
250msec
ON


⑥
1.2V
5 sec

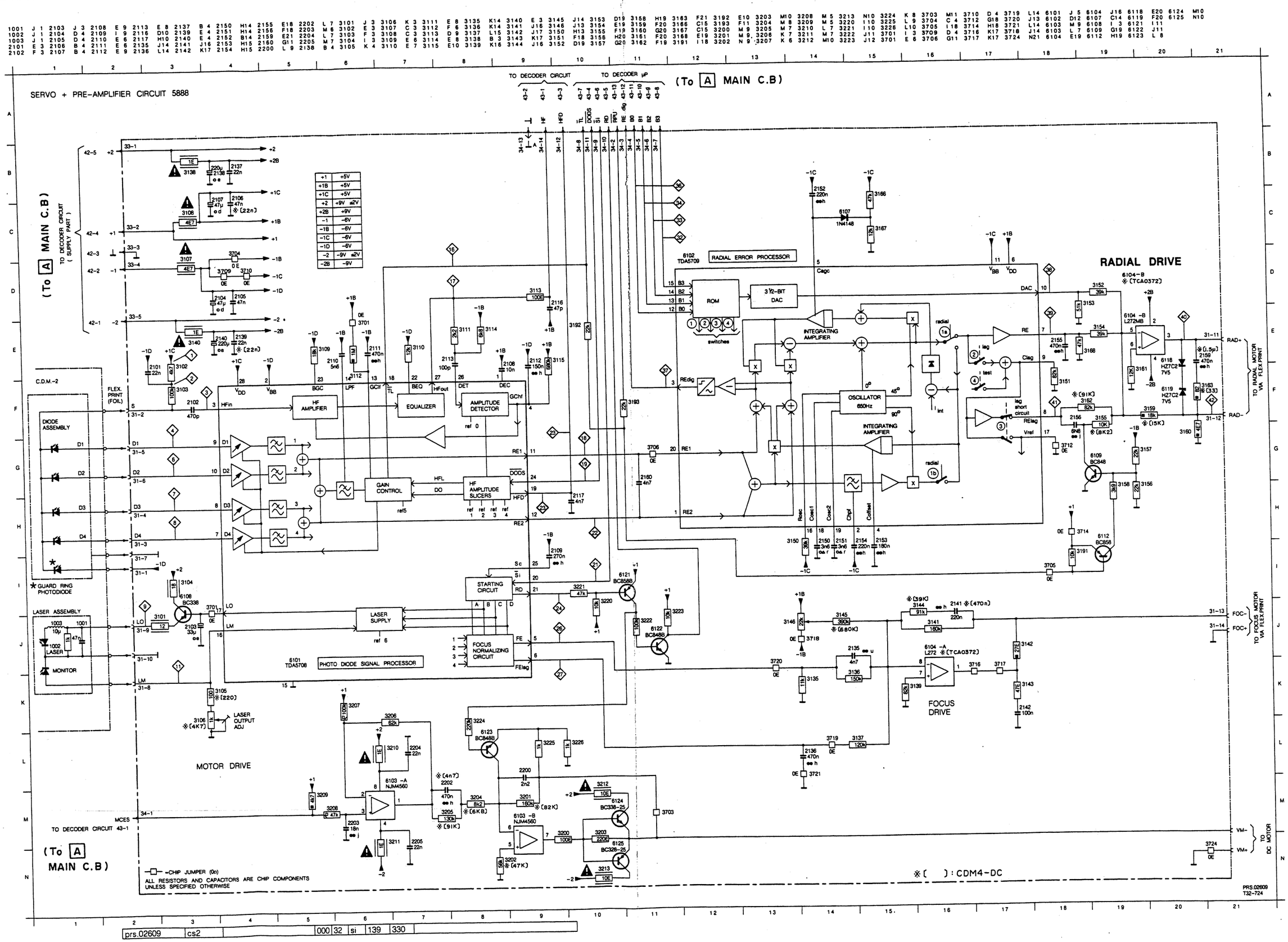

A MAIN C.B
DX-M78,M755 ONLY
DX-M45 ONLY
DX-M78,M755 ONLY
EMI 2
EMI 1
EMI 3
CJ1-1
CJ1-2
CN7
CN1
CN2
CN3
CN4
CN5
CN6
CN8
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC8
IC9
IC10
IC11
IC12
IC13
IC14
IC15
IC16
LPF
LPF 2
To SERVO C.B 33
To SERVO C.B 34

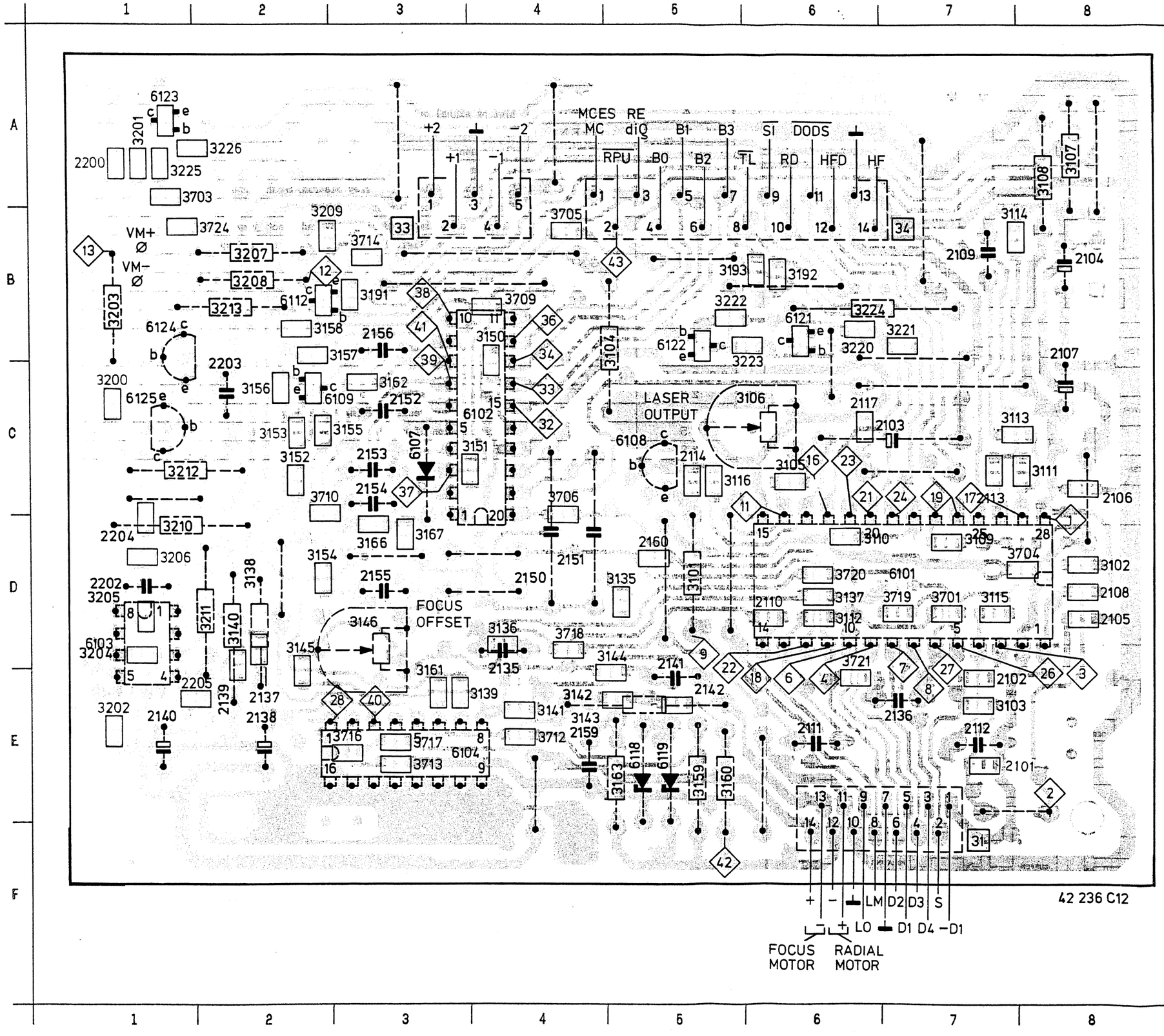

DX-M45 ONLY
C POWER C.B
E: AC220V/50Hz
K: AC240V/50Hz
(BLU)
(BRN)
CN7
PT1
(RED)
(BLK)
TH FUSE
130
K: (YEL)
E: (ORN)
L6
(NOISE
(FILTER)
To
A MAIN
C.B
CN7
D SWITCH C.B
SW2
TIMER
PLAY
ON
OFF
SW1
STAND BY/ON
ON ↔ OFF
WHT
BLU
CN8
CN1
DX-M78, M755
ONLY
To
B FRONT C.B
CN8
To
A MAIN C.B
CN1


(YEL)
(GRY)
(RED)
(BRN)
(BLK)
M1
(TRAY MOTOR)
CN3
To
A MAIN
C.B
S2
CLOSE
S1
OPEN
To
SERVO
C.B
(BLU)
(RED)
M2
(DC MOTOR)


B FRONT C.B
To A MAIN C.B
CN6
CN5
WHT
(RED)
CN8
DX-M78,
M755 ONLY
FL1
(DISPLAY)
R302
R303
R304
SW6
PLAY/REPLAY
SW8
PAUSE
SW7
STOP/CLEAR
SW13
OPEN/CLOSE
D303
D302
D301
SW4
F.SKIP
SW3
B.SKIP
SW10
F.FWD
SW9
F.BWD
SW5
MEMORY/CHECK
SW11
REPEAT
SW12
DISPLAY

SCHEMATIC DIAGRAM—2 (CDM2-DC)

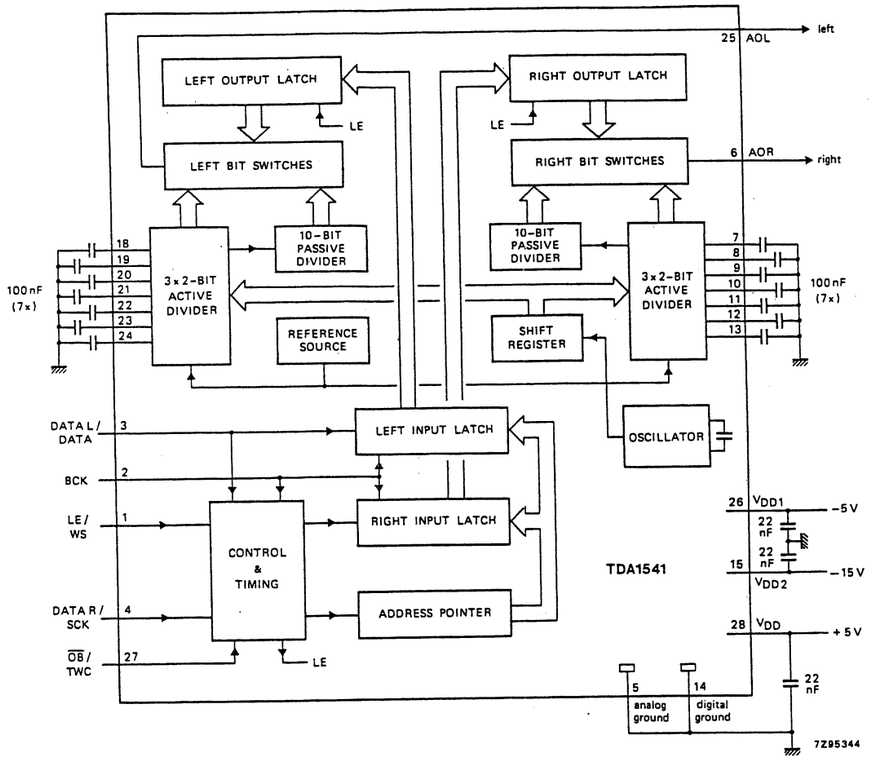




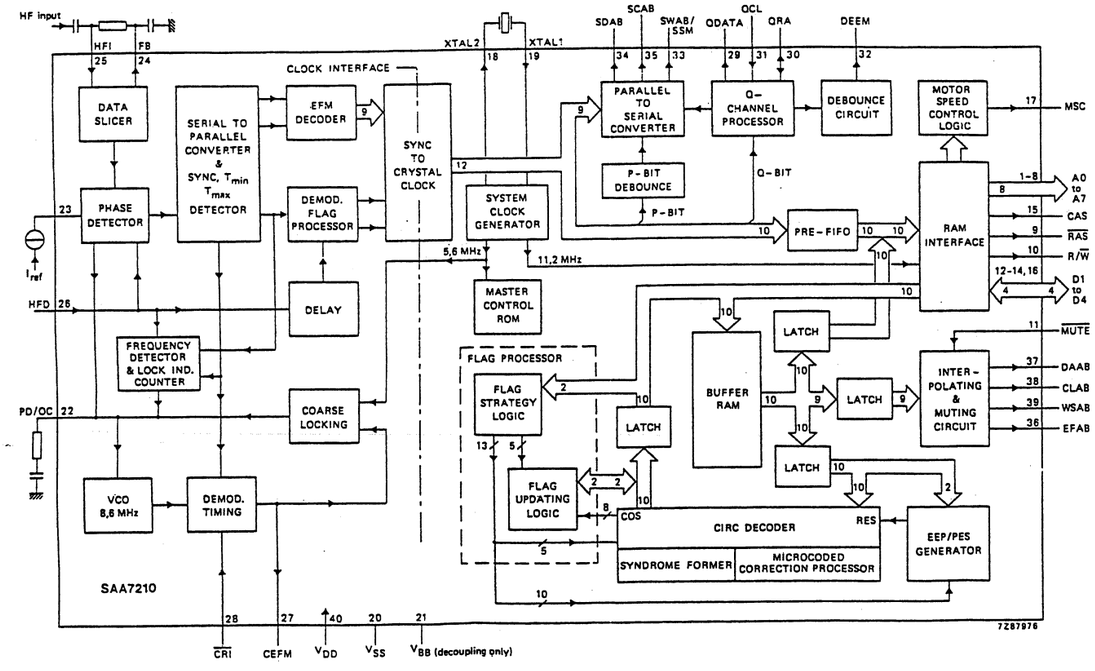
	2101	E 8						
	2102	E 7	3146	D 3		6119	E 5	
	2103	C 7	3150	B 4		6121	B 6	
	2104	B 8	3151	C 4		6122	B 5	
	2105	D 8	3152	C 2		6123	A 1	
	2106	C 8	3153	C 2		6124	B 1	
	2107	B 8	3155	C 3		6125	C 1	
A	2108	D 8	3156	C 2				
	2109	B 7	3157	B 3				
			3158	B 3				
	2110	D 6	3159	E 5				
	2111	E 6	3160	E 5				
	2112	E 7	3161	E 3				
	2113	C 7	3162	C 3				
	2114	C 5	3163	E 5				
	2117	C 6	3166	D 3				
	2135	D 4	3167	D 3				
B	2136	E 7	3191	B 3				
	2137	E 2	3192	B 6				
	2138	E 2	3193	B 5				
	2139	E 2	3200	C 1				
	2140	E 1	3201	A 1				
	2141	D 5	3202	E 1				
	2142	E 5	3203	B 1				
	2150	D 4	3204	D 1				
	2151	D 4	3205	D 1				
	2152	C 3	3206	D 1				
C	2153	C 3	3207	B 2				
	2154	C 3	3208	B 2				
	2155	D 3	3209	B 2				
	2156	B 3	3210	D 1				
	2159	E 4	3211	D 2				
	2160	D 5	3212	C 1				
	2200	A 1	3213	B 2				
	2202	D 1	3220	B 6				
	2203	C 2	3221	B 7				
	2204	D 1	3222	B 5				
	2205	E 1	3223	B 6				
D	3101	D 5	3224	B 6				
	3102	D 8	3225	A 1				
	3103	E 7	3226	A 2				
	3104	B 5	3701	D 7				
	3105	C 6	3703	A 2				
	3106	C 6	3704	D 8				
	3107	A 8	3705	B 4				
	3108	A 8	3706	C 4				
	3109	D 7	3709	B 4				
	3110	D 6	3710	C 2				
E	3111	C 8	3712	E 4				
	3112	D 6	3713	E 3				
	3113	C 7	3714	B 3				
	3114	B 7	3716	E 3				
	3115	D 7	3717	E 3				
	3116	C 5	3718	D 4				
	3119	D 7	3720	D 6				
	3135	D 5	3721	D 6				
	3136	D 4	3724	B 2				
	3137	D 6	6101	D 7				
F	3138	D 2	6102	C 4				
	3139	E 4	6103	D 1				
	3140	D 2	6104	E 3				
	3141	E 4	6107	C 3				
	3142	E 4	6108	C 5				
	3143	E 4	6109	C 2				
	3144	D 5	6112	B 2				
	3145	D 2	6118	E 5				

IC BLOCK DIAGRAM

TDA 1541



SAA 7210 (DECODER)



IC DESCRIPTION

IC3 MAB8441

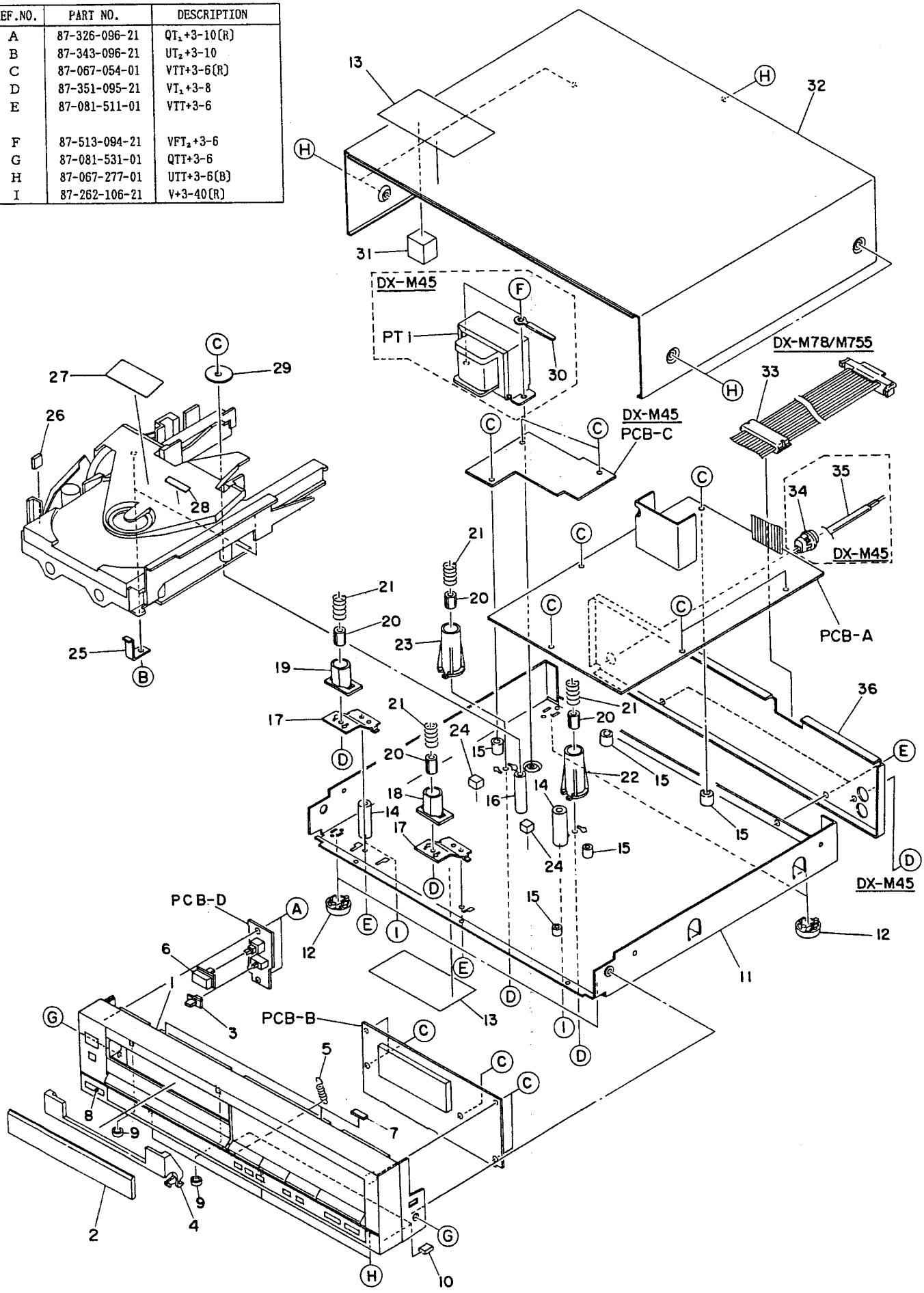
Pin No.	Pin name	Description
1,2,27,26	B0~B3	Control signals for radial servo (during play and track jump)
3	SCLK	Unused (NC)
4	$\overline{\text{MUTE}}$	Muting signal output
5	Q-EN	Q - channel Enable
6	QRA	Q - channel Request Acknowledge
7	QDATA	Q - channel Data
8	SEI/QCL	Q - channel Clock / Key Matrix Scan Input
9,10,11	SE2~SE4	Key Matrix Scan Input
12	$\overline{\text{TL}}$	Track Loss Signal (during play and track jump)
13	$\overline{\text{RP}}$	Radial Error Digital (during play and track jump)
14	GND	Ground
15	OSC	Oscillator Out
16	OSC	Oscillator In 3.0MHz
17	RES	Reset
18	OPEN	Tray Motor Control
19	CLOSE	
20,21,22	SC1~SC3	Key Matrix Scan Output
23	$\overline{\text{SI}}$	Starting focus servo and turntable control
24	$\overline{\text{DODS}}$	Drop - out suppression during track jump
25	$\overline{\text{RPU}}$	Initialization of radial servo control circut
28	Vcc	+ 5V

IC5 LC6512A-3597

<table>
<tr><th>Pin No.</th><th>Pin name</th><th>Description</th></tr>
<tr><td>42
1
2</td><td>K3
K2
K1</td><td>Key Matrix Data Inputs
<table>
<tr><td></td><td>G1 36</td><td>G2 37</td><td>G3 27</td></tr>
<tr><td>K3</td><td>F BWD</td><td>F. FWD</td><td>—</td></tr>
<tr><td>K2</td><td>B. SKIP</td><td>F. SKIP</td><td>MEMORY</td></tr>
<tr><td>K1</td><td>PLAY/REPLAY</td><td>STOP</td><td>PAUSE</td></tr>
</table>
← Stobe Signals</td></tr>
<tr><td>3</td><td>SI</td><td>Input from master microprocessor during play</td></tr>
<tr><td>4</td><td>D DATA</td><td>Display serial data input</td></tr>
<tr><td>5</td><td>MUTE</td><td>Muting input from master microprocessor</td></tr>
<tr><td>6</td><td>CBRS</td><td>CBRS input. “L” causes skipping backwards.</td></tr>
<tr><td>7
8
9</td><td>RMC A
RMC B
RMC C</td><td>Remote control data inputs
<table>
<tr><td></td><td>PLAY/REPLAY</td><td>STOP</td><td>F.SKIP</td><td>B.SKIP</td></tr>
<tr><td>RMC A</td><td>H</td><td>H</td><td>L</td><td>H</td></tr>
<tr><td>RMC B</td><td>H</td><td>L</td><td>H</td><td>H</td></tr>
<tr><td>RMC C</td><td>L</td><td>H</td><td>H</td><td>H</td></tr>
</table>
← Modes
Input data</td></tr>
<tr><td>10</td><td>SYNC I</td><td>Synchrete input</td></tr>
<tr><td>11</td><td>SYNC O</td><td>Synchrete output</td></tr>
<tr><td>12
13
14
15
16
17
18</td><td>PAUSE
START
STOP
PROG
F.S
B.S
FWD</td><td>Outputs to control the key matrix of master microprocessor.
“H” is output when a key is pressed to “on”.</td></tr>
<tr><td>24</td><td>REV</td><td>Output to control the key matrix of master microprocessor</td></tr>
<tr><td>25
26
27
36
37</td><td>G5
G4
G3
G1
G2</td><td>Segment drive outputs for the fluorescent display.
G1 - G3 are used as the strobe signals for the key matrix.</td></tr>
<tr><td>28
29
30
31
32
33
34
35</td><td>Sh
Sg
Sf
Se
Sd
Sc
Sb
Sa</td><td>Segment drive outputs for the fluorescent display. “H” lights the segment.</td></tr>
<tr><td>39</td><td>DCLK</td><td>Display data clock input</td></tr>
<tr><td>42</td><td>TPALY</td><td>Timer play switch input. “L” causes play to start.</td></tr>
</table>

EXPLODED VIEW－1 (CDM2－DC)

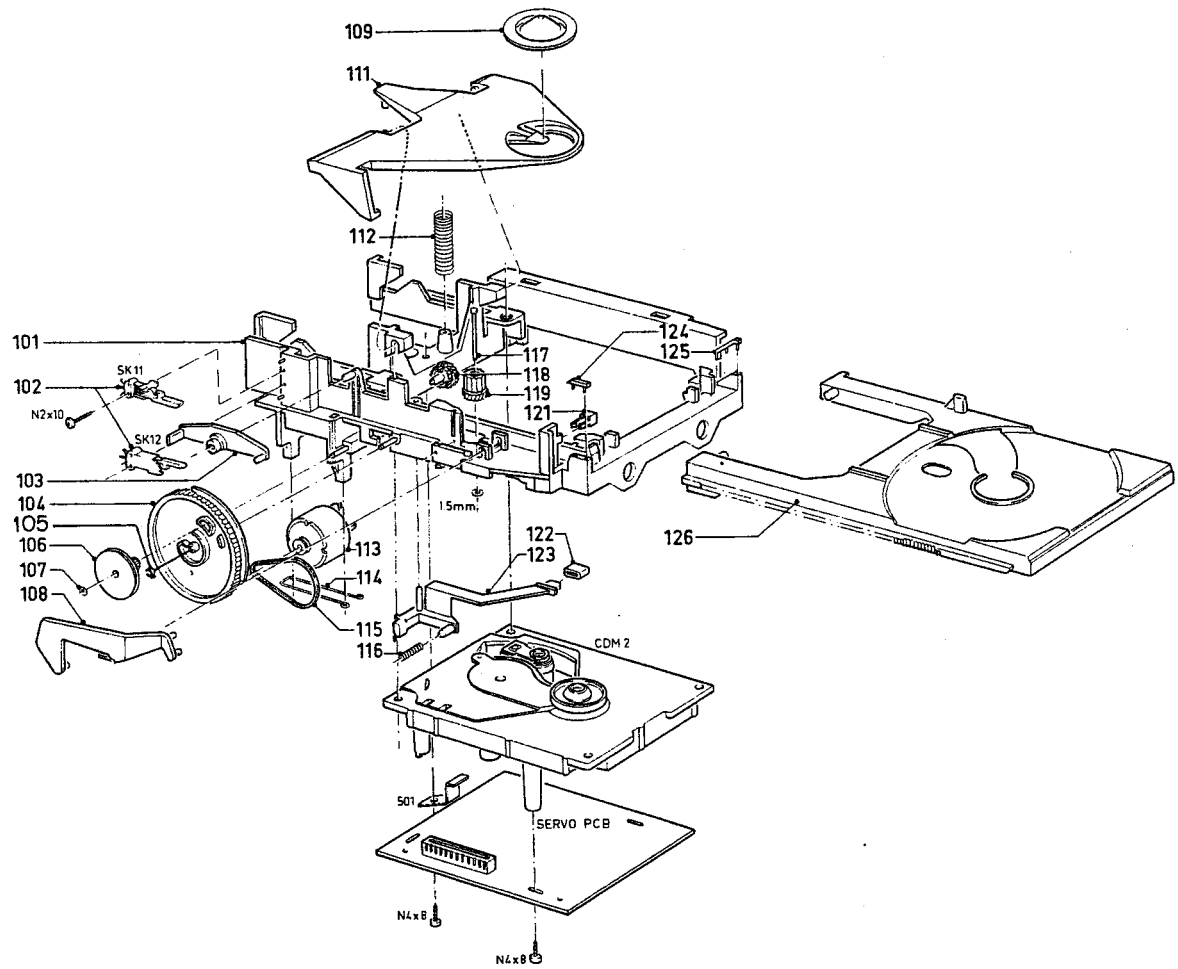
REF.NO.	PART NO.	DESCRIPTION
A	87-326-096-21	QT_1+3-10(R)
B	87-343-096-21	UT_2+3-10
C	87-067-054-01	VTT+3-6(R)
D	87-351-095-21	VT_1+3-8
E	87-081-511-01	VTT+3-6
F	87-513-094-21	VFT_2+3-6
G	87-081-531-01	QTT+3-6
H	87-067-277-01	UTT+3-6(B)
I	87-262-106-21	V+3-40(R)



MECHANICAL PARTS LIST

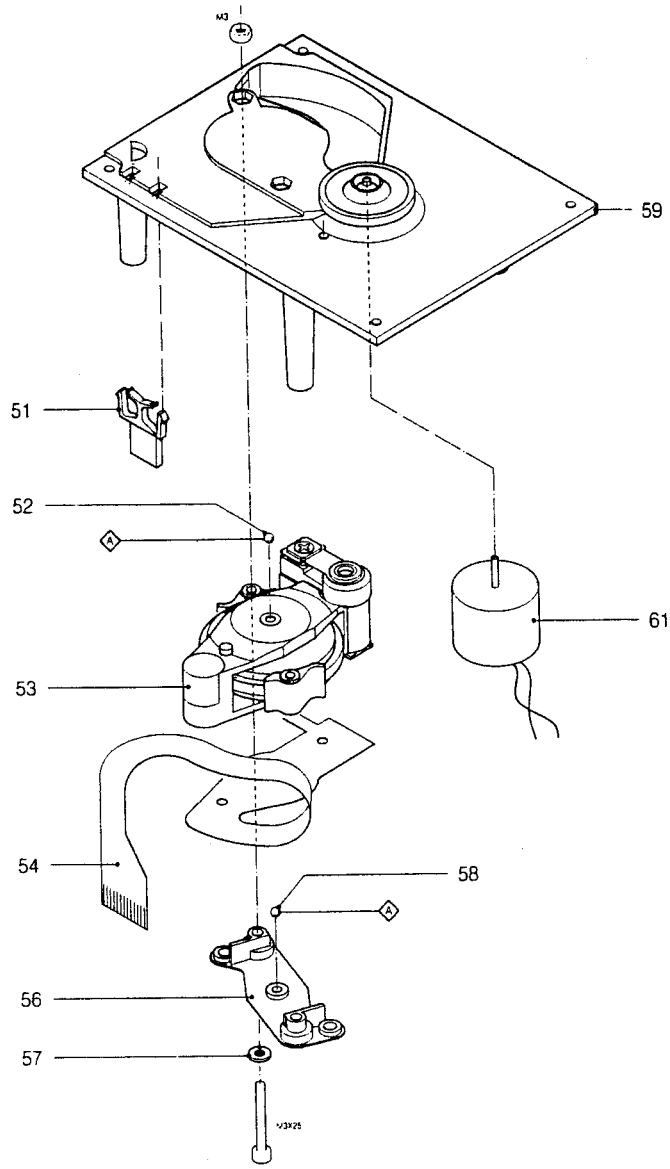
PART NO. CHANGED TO	REF. NO.	PART NO.	DESCRIPTION	COMMON MODEL	Q, TY
	1-1	*09-047-364-010	FRONT CABINET ASSY (DX-M45)	*	1
	1-1	*09-047-365-010	FRONT CABINET ASSY (DX-M78)	*	1
	1-1	*09-047-378-010	FRONT CABINET ASSY (DX-M755)	*	1
	1-2	*84-739-003-010	WINDOW,CD (DX-M45/M78)	*	1
	1-2	*84-739-024-019	WINDOW,CD (DX-M755)	*	1
	1-3	*81-715-028-019	KNOB,SLIDE (2)(DX-M78/M755)		1
	1-4	*84-739-001-010	CLAP,DOOR	*	1
	1-5	*84-739-203-010	E-SPRING,DOOR	*	1
	1-6	*84-740-009-019	KNOB,POWER		1
	1-7	*84-739-211-010	CUSHION,STEEL	*	2
	1-8	---	LABEL UK ORG (DX-M45K)		1
	1-9	*84-718-221-018	DAMPING GROMMENT	DX-660	2
	1-10	*81-539-235-010	G CUSHION 4X5X8		2
	1-11	---	CHASSIS,AMP.		1
	1-12	*87-055-057-010	FOOT B		4
	1-13	---	LABEL,TRANSPORT SCREW		2
	1-14	*84-718-227-110	CALKING SHAFT F	DX-660	2
	1-15	*84-739-206-010	CALKING SHAFT 1	*	5(M45) 3(M78/M755)
	1-16	*84-718-211-010	CALKING SHAFT A	DX-660	1
	1-17	*84-718-203-010	HOLDER F	DX-660	2
	1-18	*84-718-205-010	HOLDER,CUSHION SR	DX-660	1
	1-19	*84-718-207-010	HOLDER,CUSHION SL	DX-660	1
	1-20	*84-718-225-018	CUSHION CD	DX-660	4
	1-21	*84-718-226-018	PSPRING CD	DX-660	4
	1-22	*84-718-206-010	HOLDER,CUSHION LR	DX-660	1
	1-23	*84-718-208-010	HOLDER,CUSHION LL	DX-660	1
	1-24	*81-532-232-010	CUSHION G 6X8X8		2
	1-25	*84-735-211-018	L CLAMP	DX-666	2
	1-26	*81-730-209-010	G CUSHION 6-6-3		1
	1-27	---	LABEL,WARNING 3		1
	1-28	---	LABEL,WARNING 4		1
	1-29	*84-718-224-018	STOPPER CD	DX-660	1
	1-30	---	WIRE BINDER (DX-M45)		1
	1-31	*84-739-205-010	G CUSHION 1	*	1
	1-32	*84-739-017-018	CABINET,STEEL E	*	1
	1-33	*82-114-215-010	CORD BUSHING 13P (DX-M78/M755)		1
	1-34	*87-085-185-010	CORD BUSHING (DX-M45)		1
	1-35	*87-034-736-010	AC CORD (DX-M45 E)		1
	1-35	*87-034-975-018	AC CORD (DX-M45 K)		1
	1-36	*84-739-007-010	PANEL,REAR (DX-M45 E)	*	1
	1-36	*84-739-008-010	PANEL,REAR (DX-M45 K)	*	1
	1-36	*84-739-009-010	PANEL,REAR (DX-M78)	*	1
	1-36	*84-739-018-010	PANEL,REAR (DX-M755)	*	1

EXPLODED VIEW—2 (CDM2—DC)



PART NO. CHANGED TO	REF. NO.	PART NO.	DESCRIPTION	COMMON MODEL	Q, TY
	2-101	★S1-084-660-200	CHASSIS ASSY		1
	2-102	★S1-083-685-100	SWITCH		2
	2-103	★S1-049-028-300	SWITCH BRACKET		1
	2-104	★S1-049-029-300	CAM WHEEL		1
	2-105	★S1-034-004-400	WASHER		1
	2-106	★S1-044-309-400	PULLEY		1
	2-107	★S1-034-012-300	RING		1
	2-108	★S1-049-034-800	LEVER		1
	2-109	★S1-049-026-200	CARRIER		1
	2-111	★S1-049-036-800	P.PLATE		1
	2-112	★S1-024-145-400	C.SPRING		1
	2-113	S1-055-400-200	MOTOR ASSY		1
	2-114	★S1-024-168-200	SPRING		1
	2-115	S3-840-084-100	CLUTCH BELT		1
	2-116	★S1-024-146-300	C.SPRING		1
	2-117	S1-019-504-300	SPINDLE		1
	2-118	S1-049-032-300	GEAR WHEEL		1
	2-119	S1-049-033-300	GEAR WHEEL		1
	2-121	★S1-044-279-200	CAP		1
	2-122	★S1-049-025-300	BRAKE BLOCK		1
	2-123	★S1-049-027-500	BRAKE LEVER		1
	2-124	★S1-044-301-300	GUIDE PIECE		1
	2-125	★S1-044-300-200	GUIDE PIECE		1
	2-126	★S1-020-085-500	SLIDE ASSY		1

EXPLODED VIEW—3 (CDM2—DC)



PART NO. CHANGED TO	REF. NO.	PART NO.	DESCRIPTION	COMMON MODEL	Q, TY
	3-51	★S1-049-269-300	CLAMP PIECE		1
	3-52	S8-900-020-500	BALL		1
	3-53	S1-025-585-800	OBJECTIVE ARM		1
	3-54	★S1-032-627-200	FLEX JOIL		1
	3-56	★S1-006-031-300	PIVOT PLATE		1
	3-57	★S6-133-100-500	WASHER		1
	3-58	S8-900-020-500	BALL		1
	3-59	S1-025-775-100	MOUNT PLATE		1
	3-61	S1-028-521-100	MOTOR ASSY		1

■ ACCESSORIES/PACKAGE LIST

PART NO. CHANGED TO	REF. NO.	PART NO.	DESCRIPTION	COMMON MODEL	Q, TY
	1	★84-739-901-018	INSTRUCTION BOOKLET (DX-M45,M78)	*	1
	2	★84-739-902-018	INSTRUCTION BOOKLET (DX-M755)	*	1
	3	★87-034-978-010	CW-254 BSK (DX-M45)		1